FILE No.

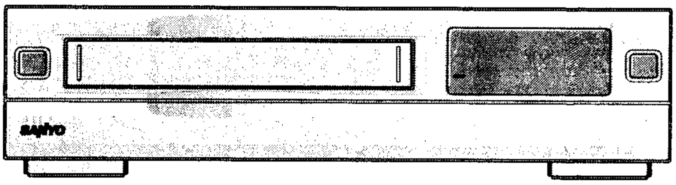
SANYO

SERVICE MANUAL

Time Lapse Video Cassette Recorder

TLS - 924P

(General Europe)



VHS
PAL

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Please see other materials with Reference number given in table below.

Materials	Model No.	Reference No.
VCR Mechanism Adjustment	TLS-2000	WM-550197

PRODAUCT SAFETY NOTICE

The components designated by a symbol (⚠) in this schematic diagram designates components whose value are of special significance to product safety. Should any component designated by a symbol need to be replaced, use only the part designated in the Parts List. Do not deviate from the resistance, wattage, and voltage ratings shown.

NOTE: 1. Parts order must contain model number, part number, and description.
2. Substitute parts maybe supplied as the service parts.
3. N.S.P.: Not available as service parts.

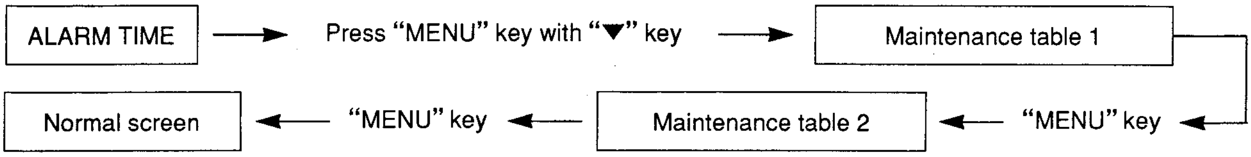
Design and specifications are subject to change without notice.

EE4Q/EX 175 800 90

REFERENCE No. SM54110

MAINTENANCE TABLE ON THE MONITOR SCREEN

To display the maintenance table, press "MENU" key with "▼" key while the fourth MENU ⟨ALARM TIME⟩ is isplayed.



Maintenance table 1

The used time of each mode (part) is displayed, and can be reset by items.
Access the maintenance-screen according to the above, and then Fig. below is displayed and HEAD TIME will blink. Move the blinking to the item to be reset with "⬇" key and press the "MENU RESET" key, and then the used time for the item will be reset (00000H).

```
         MAINTENANCE TABLE 1
 ⟨USED TIME⟩
 HEAD                  0 0 0 0 0 H
 POWER ON              0 0 0 0 0 H
 ALARM                 0 0 0 0 0 H
```

HEAD :	Used time of the video head (cylinder) total hours of ⟨MH-ON⟩ (SSB BLK2 D4) = "L" Note : Reset when the cylinder is replaced.
POWER ON :	Hours of the power supply being ON ⟨POWER ON⟩ ⟨SSB BLK1 D7⟩ = "L"
ALARM :	Number of ALARM REC. Total counts of ALARM.

Note : The data for the maintenance tables are memoried in E^2 PROM, and the memory can be kept if the timer microcomputer is reset.

Maintenance table 2

As shown in Fig. below Maintenance Table 2, ⟨ERROR⟩ is displayed on the screen.

```
        MAINTENANCE TABLE 2
 ⟨ERROR⟩
 1   1 2／2 5／9 5／   E 1   0 1
 2   ——／——／——／     ——    ——
 3   ——／——／——／     ——    ——
 4   ——／——／——／     ——    ——
 5   ——／——／——／     ——    ——
 6   ——／——／——／     ——    ——
 7   ——／——／——／     ——    ——
 8   ——／——／——／     ——    ——
```

When the "MENU RESET" key is pressed during display and resetting all data.

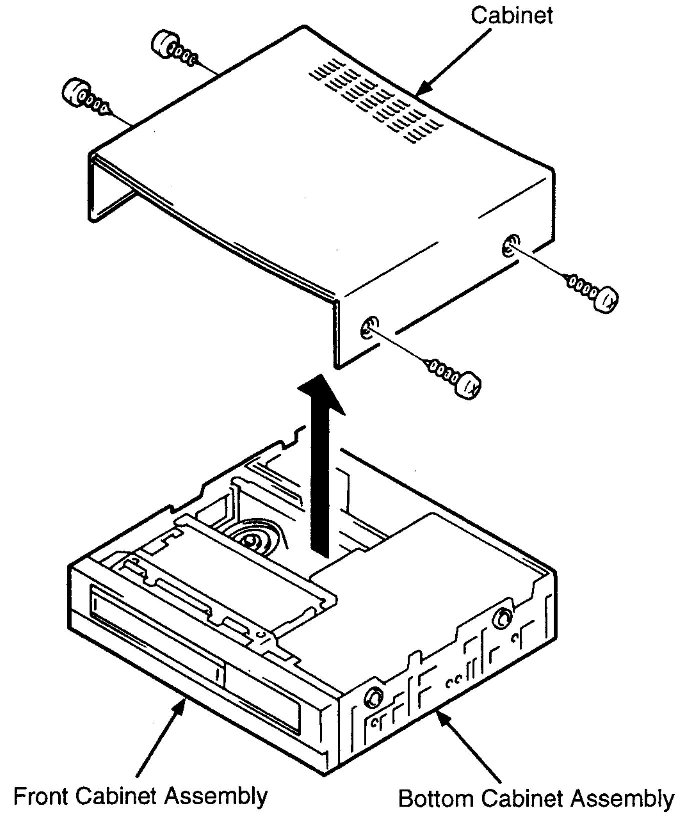
⟨ERROR⟩ : Dates and error codes are displayed when VCR happens to be in an abnormal condition and the system is down.
The newest data is displayed in the first line, and the old ones are moved down one by one. Not-displayed old data is cleared automatically.

Error Codes (Self-Diagnosis Contents)

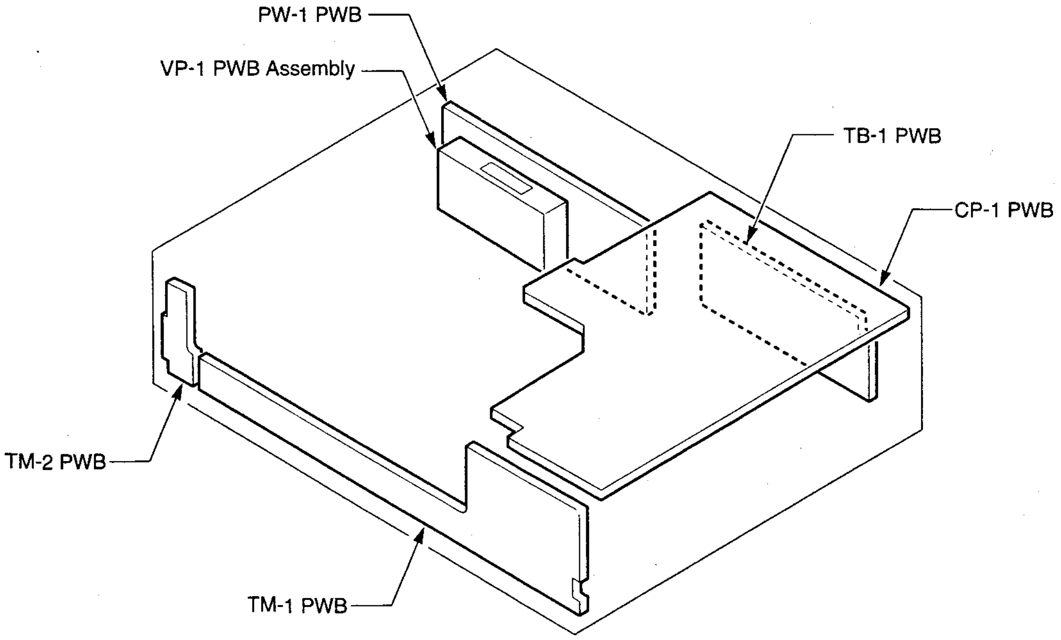
E 1→The cylinder motor does not rotate.
E 2→The take-up reel does not rotate.
E 3→The capstan motor does not rotate.
E 4→The tape cannot be loaded with the cassette inserted. (But unloading can be performed.)
E 5→The loading and unloading cannot be performed with the cassette inserted. (The tape guide is caught.)
E 6→Front unloading cannot be performed when ejecting the cassette. (Front loading can be performed.)
E 7→Front loading and front unloading cannot be performed when ejecting the cassette.
E 8→The mechanism becomes 1 (BRAKE) while moving from 2 (STOP), 3(PLAY), 4(STILL/SLOW), and to 5 (REVERSE FRAME ADVANCE). (The mechanism mode switch contact is faulty.)
E 9→The mechanism becomes 7 (INITIAL) while moving from 1 (BRAKE), 2(STOP), 3(PLAY), 4(STILL/SLOW), and to 5 (REVERSE FRAME ADVANCE). (The mechanism mode switch contact is faulty.)

1. DISASSEMBLY

1-1. REMOVAL OF CABINET


Cabinet
Front Cabinet Assembly
Bottom Cabinet Assembly

1-2. CIRCUIT BOARD LOCATIONS


PW-1 PWB
VP-1 PWB Assembly
TB-1 PWB
CP-1 PWB
TM-2 PWB
TM-1 PWB

2. ELECTRICAL ADJUSTMENT

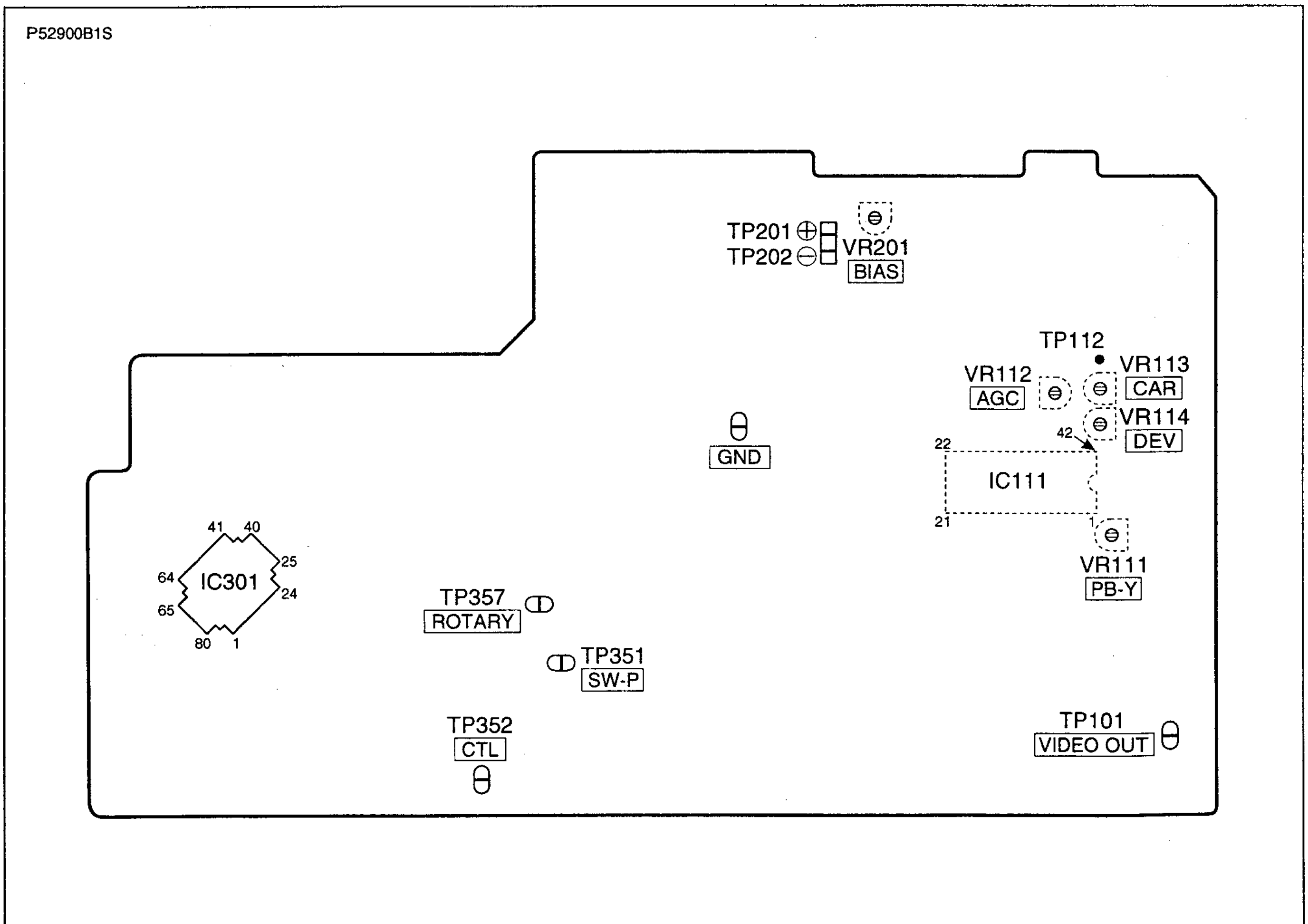
2-1. SERVO CIRCUIT ADJUSTMENT

- These adjustments should be carried out upon completion of the tape transport adjustments.
- If the tape transport abjustments (except thetilt abjustment) are done after these abjustments, follow the procedures again in section 2-1-3. "switching position adj."
- When a cassette tape is loaded, auto-tracking will be set immediately after starting the first playback. As this will deviate the tracking center set, be sure to press tracking buttons (+) or (–) once directly after starting playback to prevent auto-tracking from being set.

2-1-1. TEST EQUIPMENT AND STANDARDS REQUIRED

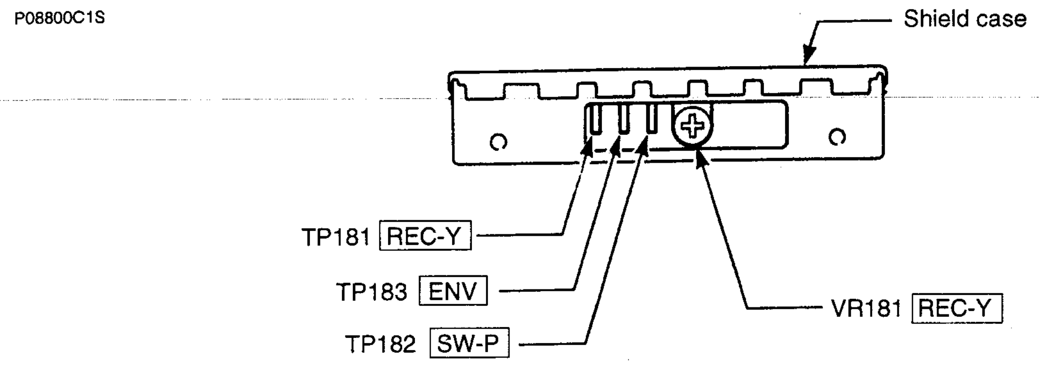
Color Bar Signal Generator	PAL color bar signal with 100% white level (EBU color bar signal)
Oscilloscope	Vertical sensitivity : 5 mV/DIV, external trigger Band width : more than 10 MHz
Alignment Tape	VHJ-0009 or VHJ-0023 : SP mode, monoscope, 6 kHz
Blank Tape	VHS-type cassette tape
Monitor TV	

2-1-2. LOCATION OF ADJUSTMENT POINTS


P52900B1S
TP201
TP202
VR201
BIAS
TP112
VR112
AGC
VR113
CAR
VR114
DEV
GND
22
42
IC111
21
1
VR111
PB-Y
41
40
25
64
IC301
24
65
80
1
TP357
ROTARY
TP351
SW-P
TP352
CTL
TP101
VIDEO OUT

CP-1 PWB (Foil side)

Fig. 2-1-1


P08800C1S
Shield case
TP181 REC-Y
TP183 ENV
TP182 SW-P
VR181 REC-Y

VP-1 PWB Assembly

Fig. 2-1-2

NOTES :

- Set the REC/PLAY SPEED button to indicator panel to the 3H (3 hours) mode.
- Self-recoding means "Record any broadcasting or video signal and play back the just-recorded portion"

2-1-3. SWITCHING POSITION ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT) TP183 (SW-P)	Oscilloscope	PLAY (3H) mode Alignment tape VHJ-0009 or VHJ-0023

Adj. Condition	Adj. Condition
REC button TRACKING (+, –) button EJECT button	6.5 H ± 0.5 H

1. Play back the alignment tape, and set the tracking control position to the center by pressing TRACKING buttons (+) and (–) simultaneously.
2. Press the REC button three times within 10 seconds after the display is shown. All three presses must be carried out within 2 seconds. For the third time, press the REC button more than 0.5 seconds as shown in Fig. 2-1-3.
3. The automatic adjustment mode is set, the numerals of Indicator display "P:00:00" chages automatically and the unit stops at the point the adjustment value becomes approx. 6.5 H.
4. In the same abjustment mode, trigger at the rising edge of the RF SW pulse, and check that the front edge of the V sync signal from the rising edge of the RF SW pulse is delayed by 6.5H ± 0.5H as shown in Fig. 2-1-4. If it is not 6.5H±0.5H, manually perform fine ajdustments for the TRACKING buttons (+) or (–) to satisfy the specification.
5. After completing adjustments, press the EJECT button (more than 1 second) and check the Indicator shows "P– : –" at this time.

NOTE : Repeat steps 1 to 4 if the adjustment takes more then 10 seconds.

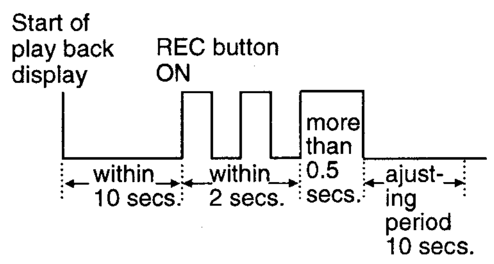

Start of
play back
display
REC button
ON
more
than
0.5
secs.
within
10 secs.
within
2 secs.
ajust-
ing
period
10 secs.

Fig. 2-1-3

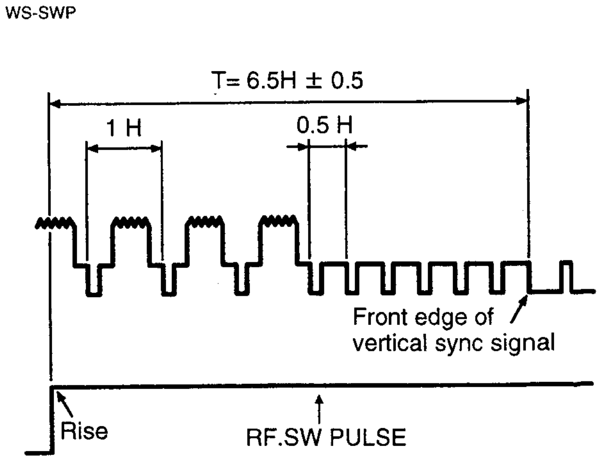

WS-SWP
T= 6.5H ± 0.5
1 H
0.5 H
Front edge of
vertical sync signal
Rise
RF.SW PULSE

Fig. 2-1-4

2-1-4. STILL V-LOCK ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
Picture of monitor TV	Color bar generator	Self-recording (3H mode) STILL mode Blank tape

Adj. Location	Adj. Value
TRACKING (+) button TRACKING (–) button	The minimum vertical shake

1. Set the REC/PLAY SPEED button to the 3H (3 hours) mode.
2. Play back the just-recorded portion and then set the VCR in the STILL mode.
3. Press the TRACKING (+) button or the TRACKING (–) button so that vertical shake of the picture is brought to its minimum.

2-1-5. SLOW SUB-TRACK ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
Picture of monitor TV	Color bar generator	Self-recording (3H mode) SLOW mode Blank tape

Adj. Location	Adj. Value
TRACKING (+), (–) button MENU-RESET button REC button	—

1. Play back the just-recorded portion in the 3H mode and set VCR in the STILL mode.
2. Set the MENU-RESET button for more than one second and set the slow mode for adjustment.
3. Press the TRACKING buttons (+) and (–) simultaneously to set the tracking control position to center.
4. Confirm that there are no noises on the play back screen in the slow mode.
5. Press the TRACKING button (+) about 11 times from tracking center position and check that noise dose not appear at the upper part of the screen.
6. Set the tracking control to the center again.
7. Prees the tracking button (–) the same number of times as in the step 5 (about 11 times) and check that noise does not appear at the lower part of the screen.
8. If there are noises. readjust the TRACKING buttons (+) or (–) so that there are no noises within ± 11 times pushes.
9. Press the REC button and preset that point as the tracking center value.
(when the REC button is pressed to take in the tracking value, that tracking value should be displayed.)
10. After inputting this data, the indicator panel will display [P– : –] for one second.

NOTE: When the TRACKING button is released, after a few seconds, the display in the indicator is turned to time display.

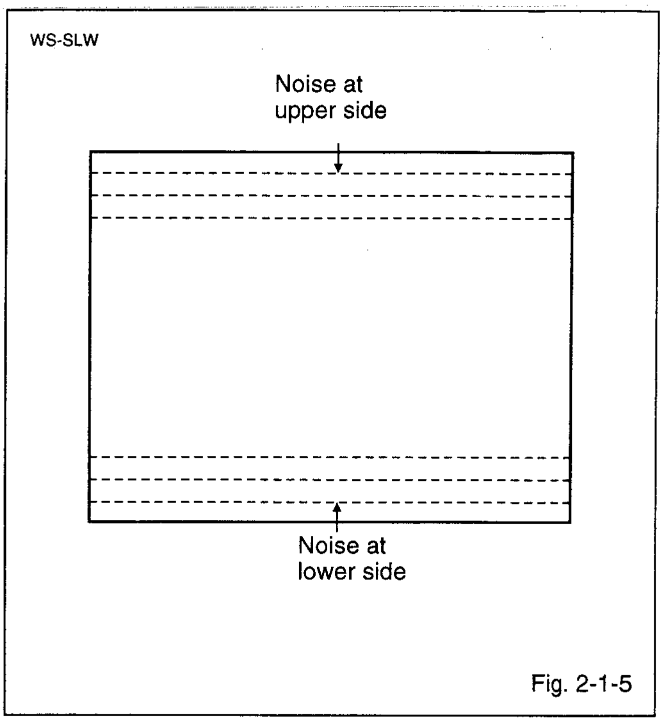


Fig. 2-1-5

2-2. VIDEO CIRCUIT ADJUSTMENT

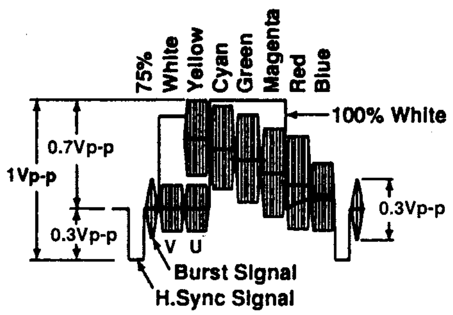
Before making the following adjustments, complete the adjustments described in section 2-1. "Servo Circuit."

2-2-1. TEST EQUIPMENT AND STANDARDS REQUIRED

Color Bar Signal Generator	PAL color bar signal with 100% white level (EBU color bar signal)
Frequency Counter	Input frequency : 20 Hz~10 MHz
Oscilloscope	Vertical sensitivity : 5 mV/DIV, external trigger Bandwidth : more than 10 MHz
Oscilloscope Probe	Input capacity : less than 25 pF (10:1) less than 40 pF (1:1) Covering frequency : DC~40 MHz (10:1) DC~30 MHz (10:1)
Alignment Tape	VHJ-0008 or VHJ-0023 : SP mode, color bar, 1 kHz (Color bar signal waveform is described below. Refer to Fig. 2-2-1.)
Blank Tape	VHS-type cassette tape
Alignment Relay Jig	VHJ-0066 : 7-wire flat cable for VP-1 PWB assembly

ALIGNMENT TAPE COLOR BAR SIGNAL

WPV-TCS


75%
White
Yellow
Cyan
Green
Magenta
Red
Blue
100% White
0.7Vp-p
1Vp-p
0.3Vp-p
0.3Vp-p
V U
Burst Signal
H.Sync Signal

Color bar signal waveform (VHJ-0008)

Fig. 2-2-1

WPV-TCP

(75%)

White	Yellow	Cyan	Green	Magenta	Red	Blue
V	U	100% White			Black	

Color bar pattern (VHJ-0008) on monitor TV

Fig. 2-2-2

ADJUSTMENT RELAY JIG

Connect the flat cable end from the cylinder assembly to the VP-1 PWB assmbly using the relay jig to provide simple repairing or adjustment of the VP-1 PWB assembly, as shown in Fig. 2-2-3. Further, when adjusting the VP-1 PWB assembly, be sure to make contact an end of shield case with bracket of the VP-1 PWB assembly to maintain the shield effect. If the VP-1 PWB assembly does not contact, there is insufficient ground and no proper play back image can be obtained.

WNV-EP4Q/U2

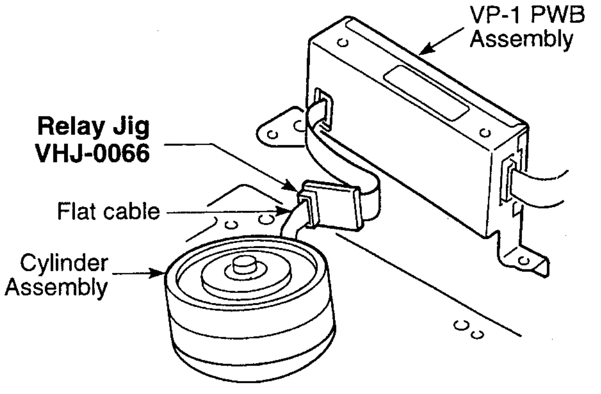
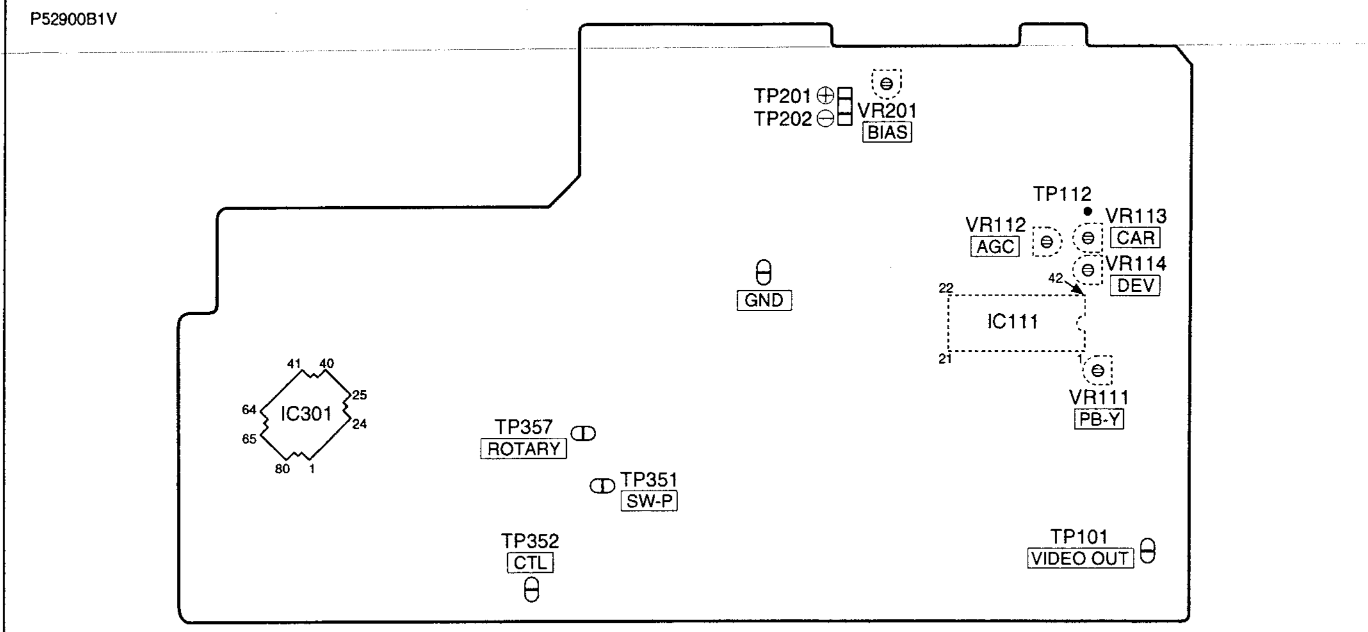

VP-1 PWB Assembly
Relay Jig VHJ-0066
Flat cable
Cylinder Assembly

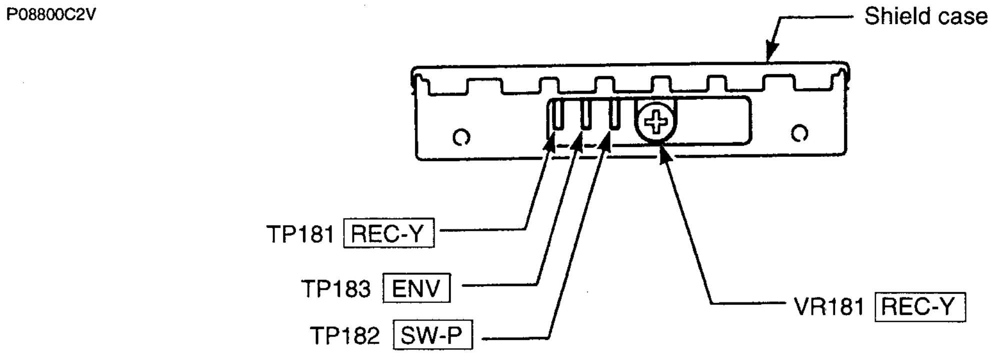
Fig. 2-2-3

2-2-2. LOCATION OF TEST POINTS


P52900B1V
TP201
TP202
VR201
BIAS
TP112
VR112
AGC
VR113
CAR
VR114
DEV
GND
22
42
IC111
21
1
VR111
PB-Y
41
40
25
64
IC301
24
65
80
1
TP357
ROTARY
TP351
SW-P
TP352
CTL
TP101
VIDEO OUT

CP-1 PWB (Foil side)

Fig. 2-2-4


P08800C2V
Shield case
TP181 REC-Y
TP183 ENV
TP182 SW-P
VR181 REC-Y

VP-1 PWB Assembly

Fig. 2-2-5

NOTE:

Self-recording weans "Record the video signal and play back the just-recorded portion."

2-2-3. AGC LEVEL ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT)	Color bar generator Oscilloscope (10:1 probe)	E-E mode

Adj. Location	Adj. Value
VR112 (AGC)	1 Vp-p ± 0.03 Vp-p

1. Terminate TP101 and ground with a 75 Ω resistor, and connect the color bar generator to the VIDEO IN terminal.
2. Adjust VR112 (AGC) for 1 Vp-p ± 0.03 Vp-p as shown in Fig. 2-2-6.

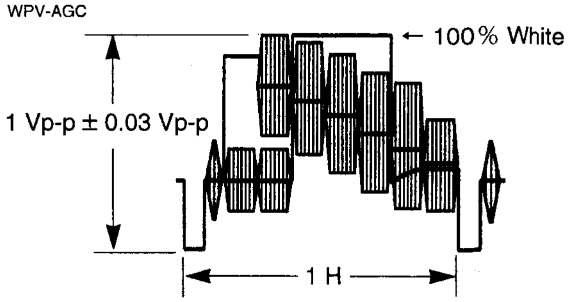


Fig. 2-2-6

2-2-4. PB-Y LEVEL ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT)	Oscilloscope	PLAY (2H)mode Alignment tape VHJ-0008 or VHJ-0023

Adj. Location	Adj. Value
VR111 (PB-Y)	1 Vp-p ± 0.03 Vp-p

1. Terminate TP101 and ground with a 75 Ω resistor.
2. Play back Alignment tape in 3H mode.
3. Adjust VR111 (PB-Y) for the video luminance signal level of 1 Vp-p ± 0.03 Vp-p. (Refer to Fig. 2-2-7)

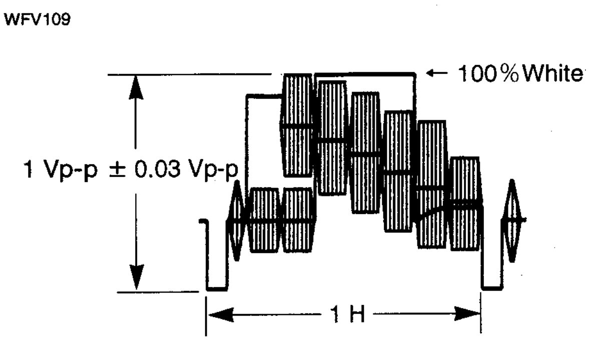


Fig. 2-2-7

2-2-5. CARRIER SET ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP112	Color bar generator Frequency counter	REC (3H) mode

Adj. Location	Adj. Value
VR113 (CAR)	4 MHz ± 0.03 MHz

1. Connect the color bar generator to the VIDEO IN terminal.
2. After removing the first color bar signal input from the VIDEO IN terminal, immediately adjust VR113 (CAR) so that the frequency becomes 4 MHz ± 0.03 MHz.

2-2-6. DEVIATION ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT)	Color bar generator Oscilloscope	Self-recording (3H) mode Blank tape

Adj. Location	Adj. Value
VR114 (DEV)	1 Vp-p ± 0.05 Vp-p

1. Record the color bar signal on the blank tape.
2. Play back of the just-recorded portion.
3. Adjust VR114 (DEV) for 1 Vp-p ± 0.05 Vp-p as shown in Fig. 2-2-8.
4. If the adjustment value is not satisfactory, adjust VR114 (DEV) and repeat steps 1 to 3.

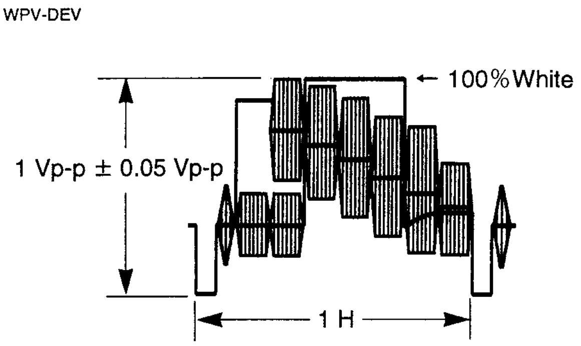


Fig. 2-2-8

2-2-7. Y REC CURRENT ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP181 (on VP-1 PWB)	Color bar generator Oscilloscope (1:1 probe)	REC (3H) mode Blank tape

Adj. Location	Adj. Value
VR181 (REC-Y)	650 mVp-p ± 5 mVp-p

1. Connect the ground of the oscilloscope to the shield case of the VP-1 PWB assembly.
2. Connect the color bar generator to the VIDEO IN terminal.
3. Adjust VR181(REC-Y) so that the video luminance signal level is 650 mVp-p ± 5 mVp-p.(Refer to Fig. 2-2-9)

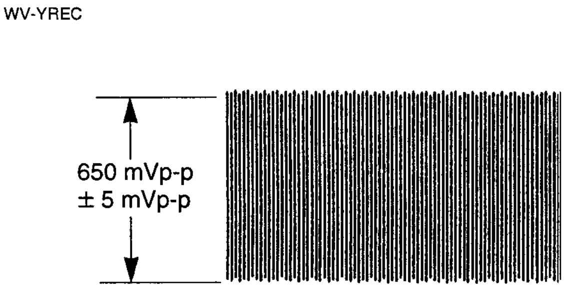


Fig. 2-2-9

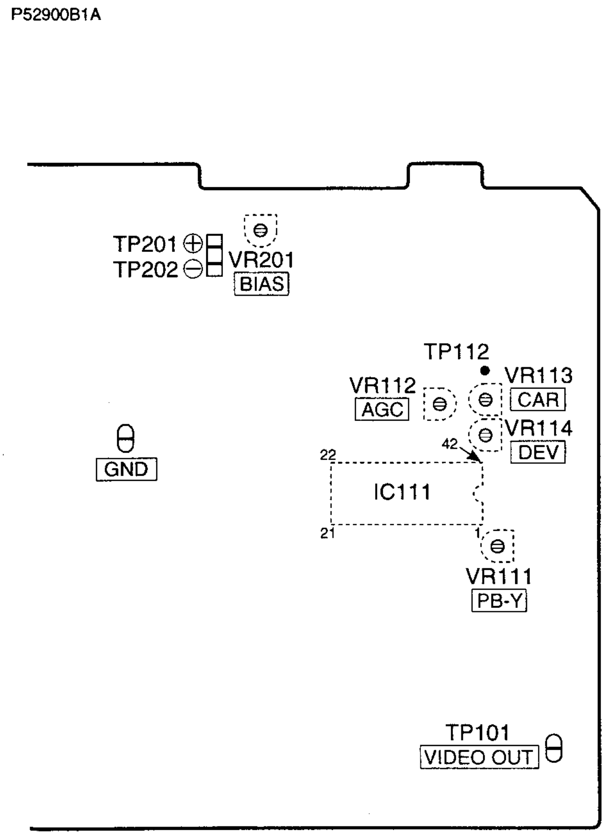
2-3. AUDIO CIRCUIT ADJUSTMENT

- Before making these adjustments, be sure to make the adjustments described in the tape path adjustment, especially the ACE heads adjustments (refer to the separate volume "TLS-2000 VCR Mechanism Adjustment") so that the tape traveling between the supply side guide roller and loading guide post runs without fluttering or curling.
- Before making these adjustments, (except the ACE heads adjustments), be sure to make the adjustments described in section 2-1. "Servo Circuit." and section 2-2. "Video Circuit."

2-3-1. TEST EQUIPMENT AND STANDARDS REQUIRED

Color Bar Signal Generator	PAL color bar signal with 100% white level (EBU color bar signal)
Oscilloscope	Vertical sensitivity : 5 mV/DIV Bandwidth : more than 30 MHz
AC Voltmeter	Effective value indication Input frequency : 10 Hz~20 kHz Input impedance : more than 1 MΩ Measurement level : 1 mV (full scale)
Frequency Counter	Input frequency : 20 Hz~10 MHz
Blank Tape	VHS-type cassette tape

2-3-2. LOCATION OF ADJUSTMENT POINTS



CP-1 PWB (Foil side) Fig. 2-3-1

NOTE :

- Set the following switch to the positions indicator below, before making following adjustments.

SWITCH	POSITION
REC/PLAY SPEED	3 H

2-3-3. BIAS LEVEL ADJ.

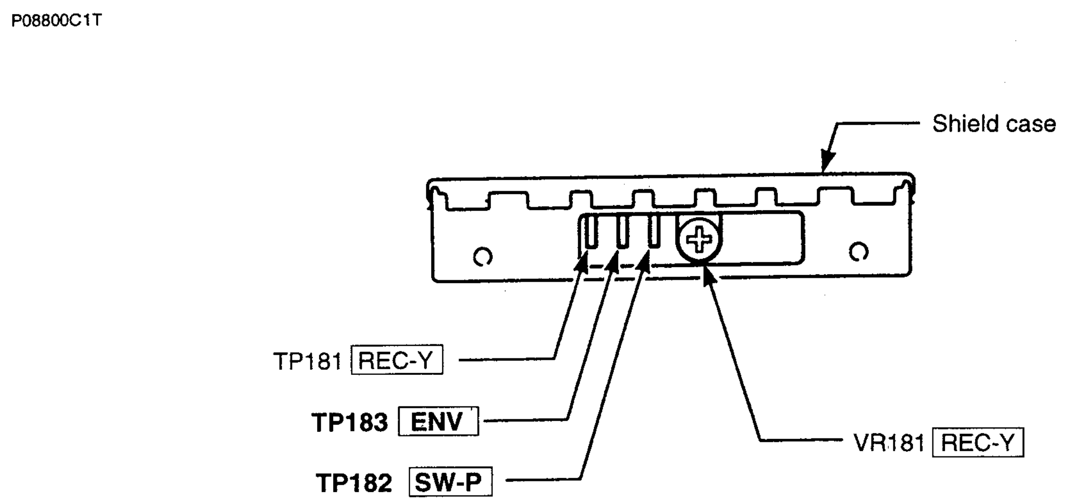
Measuring Point	Measuring Equipment	Adj. Condition
TP201 (HOT) TP202 (COLD)	Color bar generator Oscilloscope AC voltmeter Frequency counter	REC mode Blank tape

Adj. Location	Adj. Value
VR201 (BIAS)	21 mVrms

1. Connect the color bar generator to the VIDEO IN terminal.
2. Load the VCR with a blank tape and select the record mode without all incoming signal.
3. After confirming on the oscilloscope that a 70kHz ± 5 kHz sine wave is being output, adjust VR201 (BIAS) so that the AC voltmeter's reading is 21 mVrms.

3. TEST POINTS FOR TAPE PATH ADJUSTMENT

Test points TP182 (ENV) and TP183 (SW-P) for tape path adjustment are shown in figure below.
For adjustment, refet to the separate volume "TLS-2000 VCR Mechanism Adjustment" (WM-550197).


P08800C1T
Shield case
TP181 REC-Y
TP183 ENV
TP182 SW-P
VR181 REC-Y

VP-1 PWB Assembly

Fig. 3-1

4. PARTS LIST

ACCESSORIES

LOCATION	PARTS NO.	DESCRIPTION
	613 167 1461	INSTRUCTION MANUAL
⚠	613 095 0550	CORD,POWER
OR ⚠	613 133 2393	CORD,POWER
OR ⚠	645 002 6805	CORD,POWER
OR ⚠	645 003 3766	CORD,POWER

****

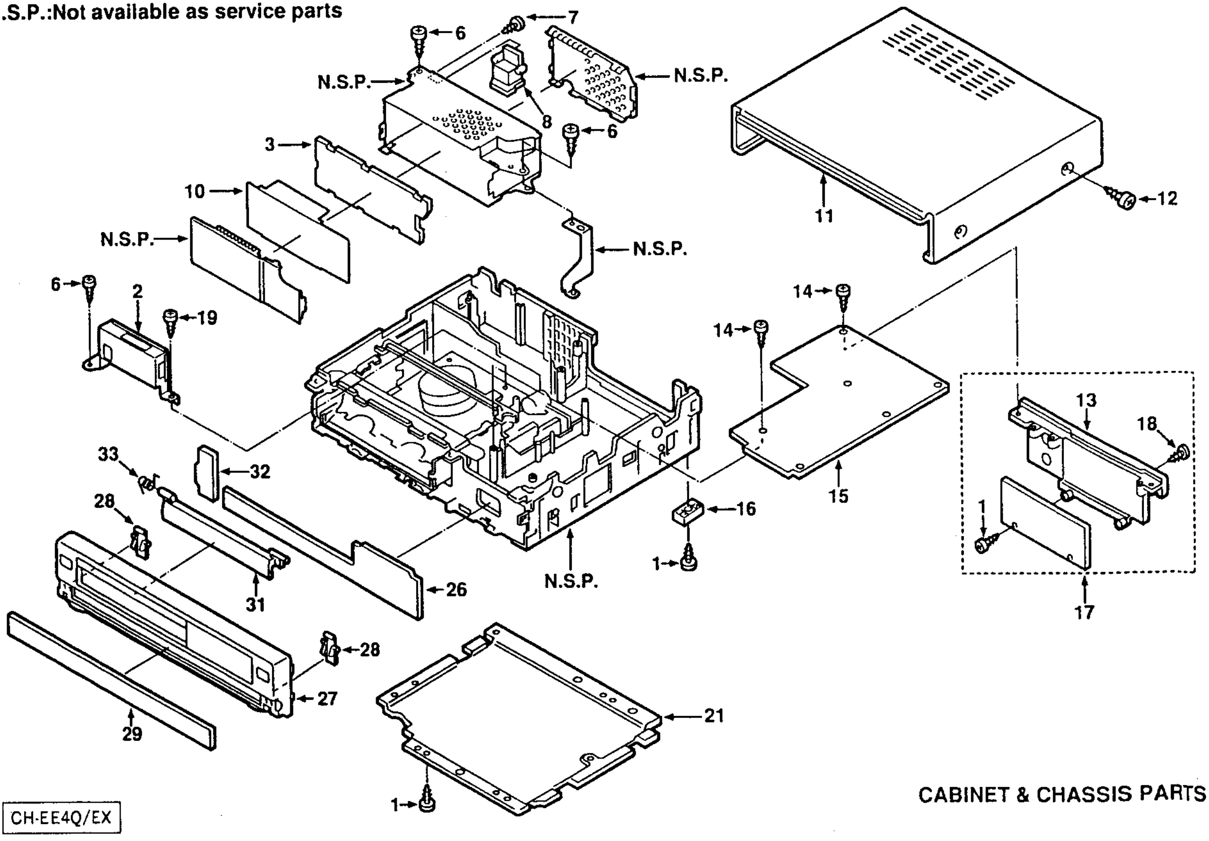
PACKING MATERIALS

LOCATION	PARTS NO.	DESCRIPTION
	613 166 7372	CARTON CASE
	613 166 7389	CUSHION,FRONT
	613 166 7396	CUSHION,BACK
	613 139 8047	POLYE COVER,INNER-K

CABINET & CHASSIS PARTS

LOCATION	PARTS NO.	DESCRIPTION
CH-1	411 137 0007	SCR L-TPG BIN 3X10
CH-2	613 166 4630	COMPL PWB,VP-1
CH-3	613 166 4678	COMPL PWB,PW-1
CH-6	411 021 7907	SCR S-TPG BIN 4X12
CH-7	411 021 6405	SCR S-TPG BIN 3X8
CH-8	613 166 4685	COMPL PWB,PW-2
CH-10	613 135 7839	INSULATOR
CH-11	613 155 4412	COVER,TOP
CH-12	412 028 9406	SPECIAL SCREW
CH-13	613 163 3469	TERMINAL
CH-14	411 021 3800	SCR S-TPG BIN 3X10
CH-15	613 166 5200	COMPL,PWB CP-1-A
CH-16	613 096 7282	STAND,REAR,BACK
CH-17	613 166 4555	COMPL PWB,TB-1
CH-18	411 023 4706	SCR S-TPG PAN 3X12
CH-19	411 001 1901	SCR S-TPG BIN 3X6
CH-21	613 121 0967	COVER,BOTTOM
CH-26	613 166 4579	COMPL PWB,TM-1
CH-27	613 166 7266	ASSY,CABINET FRONT
CH-28	613 048 2884	LOCK
CH-29	613 166 7716	ASSY,DOOR
CH-31	613 167 2215	DOOR CASSETTE
CH-32	613 166 4616	COMPL PWB,TM-2
CH-33	613 166 9925	SPRING

Location No.:CH-
N.S.P.:Not available as service parts

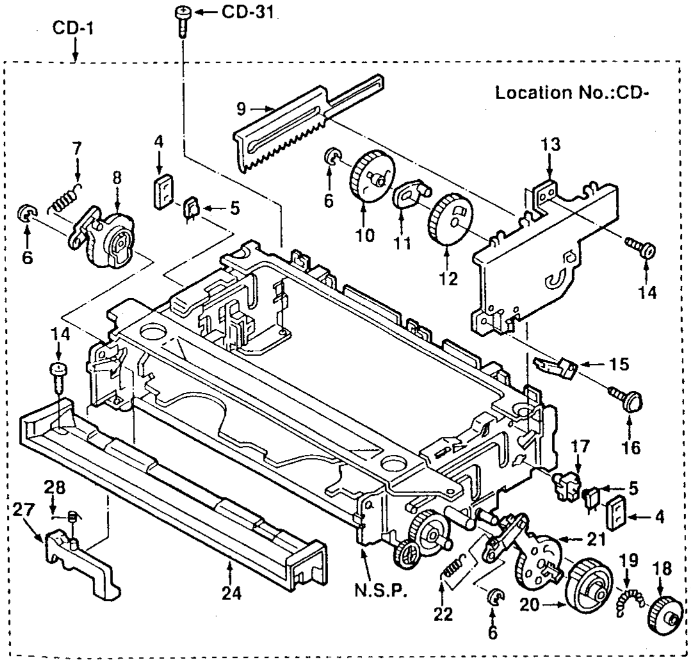


CABINET & CHASSIS PARTS

MECHANISM PARTS

MECHANISM PARTS 1

LOCATION	PARTS NO.	DESCRIPTION
CD-1	613 125 4862	COMPL,CASSETTE MECHANISM
CD-4	613 022 0585	LID
CD-5	407 098 3201	PHOTO COUPLE PN150SAN
CD-6	411 015 9801	RING E 2.3
CD-7	613 022 1643	SPRING,LINK L
CD-8	613 022 0073	ASSY,GEAR,LEVER L
CD-9	613 022 2695	RACK
CD-10	613 141 6109	GEAR,LOCK
CD-11	613 139 8962	ASSY,LEVER,PINION
CD-12	613 022 2626	GEAR,PINION
CD-13	613 021 9657	ASSY,BRACKET,GEAR
CD-14	411 027 1305	SCR S-TPG BIN 2.6X4
CD-15	613 095 0949	SW,SPECIAL
CD-16	411 106 9208	SCR PAN+SW+W 2X9
CD-17	613 022 0943	HOLDER,TRANSISTOR
CD-18	613 022 2619	GEAR,IDLER
CD-19	613 022 1667	SPRING,GEAR MAIN
CD-20	613 022 2596	GEAR,MAIN
CD-21	613 022 0097	ASSY,GEAR,LEVER R
CD-22	613 022 1674	SPRING,LINK R
CD-24	613 022 4064	BOARD,UNDER
CD-27	613 124 5006	LEVER,SAFETY SW
CD-28	613 125 6149	SPRING,SAFETY SW
CD-31	411 001 8702	SCR BIN 3X6
MA-1	613 102 9279	ASSY,LEVER,TENSION
MA-2	613 105 5698	SPRING,LEVER TENSION
MA-3	613 100 4573	ASSY,HOLDER,BAND
MA-4	411 130 5207	SCR PAN+FLG 2.6X2.4
MA-5	411 109 1605	WASHER Y 2.6X6X0.25
MA-6	613 150 2550	ASSY,REEL,SUPPLY
OR	613 093 3904	ASSY,REEL,SUPPLY
MA-7	613 139 7859	ASSY,REEL,TAKE UP
OR	613 093 3898	ASSY,REEL,TAKE UP
MA-8	412 021 5306	SPECIAL WASHER 3.1X6X0.3
MA-8	412 015 8900	SPECIAL WASHER 3.1X6X0.4
OR	412 015 8504	SPECIAL WASHER 3.1X6X0.5
MA-9	411 109 1506	WASHER Y 2.1X6X0.25
OR	411 109 1407	WASHER Y 2.1X5X0.25
MA-10	613 093 3959	GEAR,REEL SUPPLY
MA-11	412 026 7305	SPECIAL WASHER 2.6X6X0.25
MA-12	613 103 2644	GEAR,REEL TAKE UP
MA-13	412 041 7205	WASHER 2.6X6X0.13
MA-15	412 042 4302	SPECIAL SCREW 2.6X4
MA-16	613 100 4696	COMPL,IDLER,CLUTCH
MA-17	411 120 1301	WASHER Y 2.1X4X0.25
MA-18	613 100 4689	ASSY,IDLER
MA-19	411 021 3107	SCR S-TPG BIN 2.6X8
MA-20	613 120 9053	COMPL PCB,MC-4
MA-21	407 016 7205	LED LN59
MA-22	613 100 4641	ASSY,SLIDE,ACT PLATE
MA-23	613 142 9086	SLIDE,C BRAKE
MA-24	613 022 1612	SPRING,RETURN SLIDE
MA-25	613 022 1506	SPRING,SUB T
MA-26	613 098 0106	ASSY,BRAKE SUB T
MA-27	613 103 2651	PULLEY,REEL
MA-28	613 022 1490	SPRING,SUB SUPPLY
MA-29	613 022 2374	SLIDE,ACT BRAKE
MA-30	613 084 8871	BRAKE,SUB SUPPLY
MA-31	613 167 3892	ASSY,SLIDE MAIN PLATE
MA-32	613 080 9216	ASSY,BRAKE,SUPPLY
MA-33	613 022 1544	SPRING,MAIN BRAKE
OR	613 086 2914	SPRING,MAIN BRAKE
MA-34	613 080 9209	ASSY,BRAKE,TAKE UP
MA-35	411 109 3005	WASHER Y 2.6X5X0.5
MA-36	613 022 2015	LEVER,CONT PLATE
MA-37	412 015 9501	SPECIAL WASHER
MA-38	411 021 7907	SCR S-TPG BIN 4X12
MA-39	412 045 4606	SPECIAL WASHER 2.4X6X0.25
MA-41	412 015 9600	SPECIAL WASHER
MA-42	613 105 5728	SPRING,LEVER BRAKE
MA-43	613 100 7659	ASSY,LEVER,BRAKE BAND



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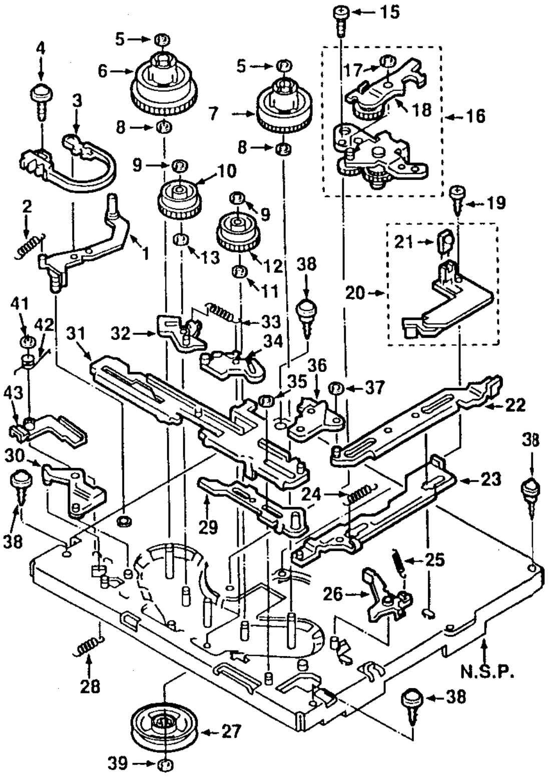

95EA4/MA-1

N.S.P.:Not available as service parts

MECHANISM PARTS 2

LOCATION	PARTS NO.	DESCRIPTION
DR-1	613 166 2933	COMPL,CYLINDER 2N4P-Q
DR-2	411 038 1608	SCR PAN+W 3X8
DR-3	613 166 2926	ASSY,CYLINDER,UPR 2N4P-Q
DR-4	613 078 8566	ASSY,CYLINDER,LWR 4
DR-5	613 097 2170	SPACER,MOTOR
DR-6	613 088 9072	BASE,CYLINDER
OR	613 022 1001	BASE,CYLINDER
DR-7	411 047 7509	SCR PAN+FLG 3X6
DR-8	411 047 5000	SCR PAN+FLG 2.6X8
OR	412 030 9708	SPECIAL SCREW 2.6X9
DR-9	613 085 7279	STATOR,MOTOR CYL
OR	613 132 3520	STATOR,MOTOR CYL
DR-10	411 044 8301	SCR PAN+SW 2.3X10
OR	411 044 9209	SCR PAN+SW 2.3X8
OR	412 036 4905	SPECIAL SCREW 2.3X10
DR-11	613 022 4019	ROTOR,MOTOR CYL
DR-12	411 044 9001	SCR PAN+SW 2.3X6
OR	412 036 5001	SPECIAL SCREW 2.3X6
MB-1	613 123 4802	SLEEVE
MB-2	613 053 3227	SPECIAL WASHER
MB-3	613 123 4970	TAPE GUIDE
MB-4	411 004 5302	NUT HEX 3
MB-5	613 123 9418	CAP
MB-6	613 152 8079	SLIDE,ACT PINCH
MB-7	613 021 9800	ASSY,LEVER,CAM PINCH
MB-8	411 109 2008	WASHER Y 3.1X8X0.5
MB-9	613 022 1797	SPRING,ACE HEAD
MB-10	613 021 9640	COMPL,BRACKET,HEAD
MB-11	613 110 1692	SLEEVE,ACE HEAD
MB-12	412 015 8207	SPECIAL NUT (M5)
MB-13	411 120 0007	SCR PAN+SW+W 2.6X5
MB-14	613 120 3631	BRACKET,STOPPER
MB-15	613 105 5711	SPRING,SLIDE BRAKE
MB-16	613 100 4610	COMPL,SLIDE,CAM
MB-17	613 157 5905	SPRING,LINK LOCK
MB-18	613 022 2725	DAMPER
MB-19	613 022 2534	GEAR,FRONT LOAD
MB-20	613 094 1206	ASSY,LEVER,FRONT
MB-21	613 134 2910	GEAR,HELICAL FRONT
MB-22	411 046 8002	SCR PAN+SW+W 2.6X6
MB-23	411 023 2801	SCR S-TPG PAN 2.6X6
MB-24	411 021 3107	SCR S-TPG BIN 2.6X8
MB-26	645 004 1754	R-SPECIAL DEW SENSOR
MB-28	613 077 3227	HOLDER,WORM
MB-29	613 027 0382	WASHER
MB-30	613 078 8320	ASSY,WORM,FRONT
MB-31	613 117 0599	BRACKET,HOLDER
MB-32	613 093 9159	PLATE,NUT
MB-33	613 093 8374	DAMPER,MOTOR
MB-34	613 077 3616	DAMPER,WORM
MB-35	613 121 9960	ASSY,LOADING MOTOR
MB-36	613 092 9945	DAMPER,MOTOR
MB-37	613 107 2732	COMPL,PCB,MC-3
MB-39	645 008 7837	ROTARY SWITCH
MB-40	411 126 5303	SCR PAN 2.6X13
MB-41	613 092 9921	ASSY,SLIDE,FRONT
MB-42	613 092 5985	SPRING,LEVER LOAD
MB-43	613 092 5992	SPRING,LEVER ACT
MB-44	613 092 5886	HOLDER,WORM
MB-45	613 027 0627	WASHER 2.1X6X0.5
MB-46	613 092 9938	ASSY,WORM,LOAD
MB-47	613 022 2985	BELT,LOADING
MB-48	412 033 4106	WASHER SLIT 2.6X5X0.50
MB-49	613 077 3579	GEAR,HELICAL
MB-50	613 102 9293	ASSY,LEVER,REV GUIDE
MB-51	613 022 1568	SPRING,REVIEW LEVER
MB-52	613 022 0158	COMPL,PINCH ROLLER
MB-53	613 022 1483	SPRING,PINCH ROLLER
MB-54	411 109 2107	WASHER Y 3.6X6X0.5
MB-55	613 078 8160	COMPL,LEVER,ACT BRAKE
MB-56	411 031 1209	SCR BIN 2.6X5
MB-57	613 022 1919	PLATE,GUIDE
MB-58	613 108 2953	ASSY,BASE,ROLLER S
MB-59	613 021 9732	ASSY,BASE,ROLLER T
MB-60	411 063 0904	SCR SET HEX-SCT 2X3
MB-61	613 022 0233	ASSY,GUIDE,ROLLER
MB-62	411 109 2602	WASHER Y 1.5X4X0.25
MB-63	645 014 5612	HEAD,ERASE FULL
MB-64	613 082 4660	IMPEDANCE ROLLER
MB-65	412 032 5807	SPECIAL WASHER 2.1X5X0.13
MB-66	613 136 0334	ASSY,LEVER,FE HEAD
MB-67	613 022 1698	SPRING,ERASE HEAD
MB-80	411 167 9704	WASHER Y 2.7X4.6X0.5
MB-81	613 157 4052	ASSY,ROLLER,CLEANER
MB-82	613 167 6459	ASSY,LEVER,CLEANER TL
MB-83	613 119 8593	SPRING
MB-84	613 142 9055	BRACKET,CLEANER

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MECHANISM PARTS 3

LOCATION	PARTS NO.	DESCRIPTION
MC-1	613 130 9425	MOTOR,CAPSTAN
MC-2	613 093 4031	BELT,REEL DRIVE
MC-3	613 135 4609	COMPL,LEVER,CLUTCH
MC-6	613 022 1520	SPRING,LEVER CLUTCH
MC-7	613 082 3434	LEVER,CHANGE CLUTCH
MC-8	613 022 1711	SPRING,CHANGE CLUTCH
MC-9	613 081 7518	ASSY,BRAKE CAPSTAN
MC-10	613 098 2285	SPRING,CAPSTAN
MC-12	411 021 3107	SCR S-TPG BIN 2.6X8
MC-13	411 109 2008	WASHER Y 3.1X8X0.5
MC-14	613 142 9093	SLIDE,CAM PLATE
MC-15	613 099 7555	CAM,MODE
MC-16	411 109 1902	WASHER Y 3.1X6X0.5
MC-17	613 167 1096	CAM,MAIN TL
MC-18	613 135 7532	ASSY,RACK,LOAD
MC-19	411 109 1803	WASHER Y 2.6X6X0.5
MC-20	613 135 7648	SPACER,RACK LOAD
MC-22	411 047 6809	SCR PAN+FLG 3X4
MC-23	613 021 9763	ASSY,EARTH,CYL
MC-24	613 135 7662	GEAR,LOAD TAKE UP
MC-25	613 022 1551	SPRING,GEAR LOAD T
MC-26	613 021 9879	ASSY,LEVER,LOAD T
MC-27	613 090 6373	GEAR,LOAD S
MC-28	613 022 1704	SPRING,GEAR LOAD S
MC-29	613 021 9862	ASSY,LEVER,LOAD S
MC-30	613 099 7418	LEVER,RETURN TENSION
MC-31	613 091 3104	ASSY,LEVER CONTROL
MC-32	411 087 6005	WASHER V 2.6X7.5X0.5
MC-33	411 022 8903	SCR S-TPG PAN 2.3X12
MC-34	411 040 2303	SCR PAN 2.6X5
MC-35	412 015 8603	SPECIAL WASHER 3.1X6X0.25
MC-36	613 154 0637	ASSY,GEAR,FRICTION
MC-37	412 045 4606	SPECIAL WASHER 2.4X6X0.25
MC-38	613 105 5704	SPRING,REVERSE TENSION
MC-39	613 103 2538	BRACKET,PULLEY
MC-40	411 100 0300	SCR S-TPG BIN 2.6X5
MC-41	613 122 9884	COMPL PCB,MC-1

MECHANISM PARTS 2

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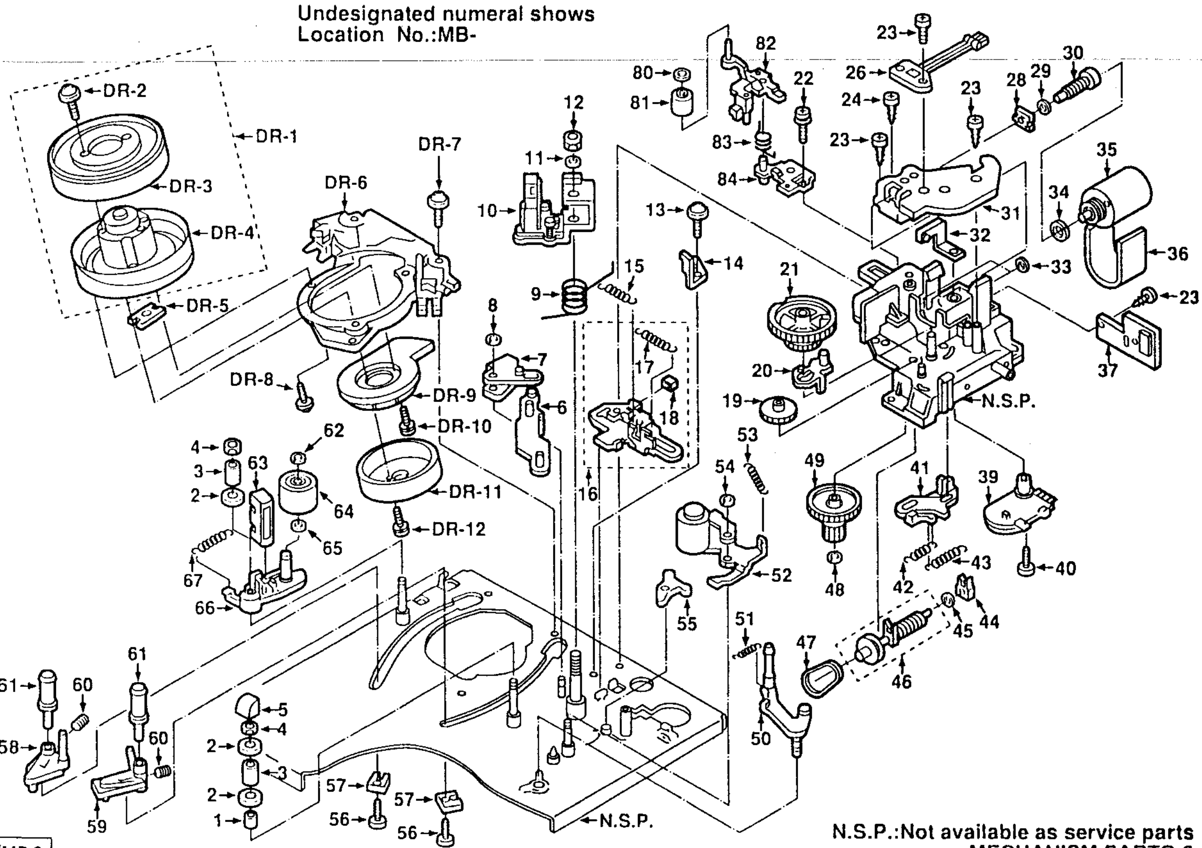

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95EA4/MB-2

N.S.P.:Not available as service parts
MECHANISM PARTS 2

MECHANISM PARTS 3

Undesignated numeral shows
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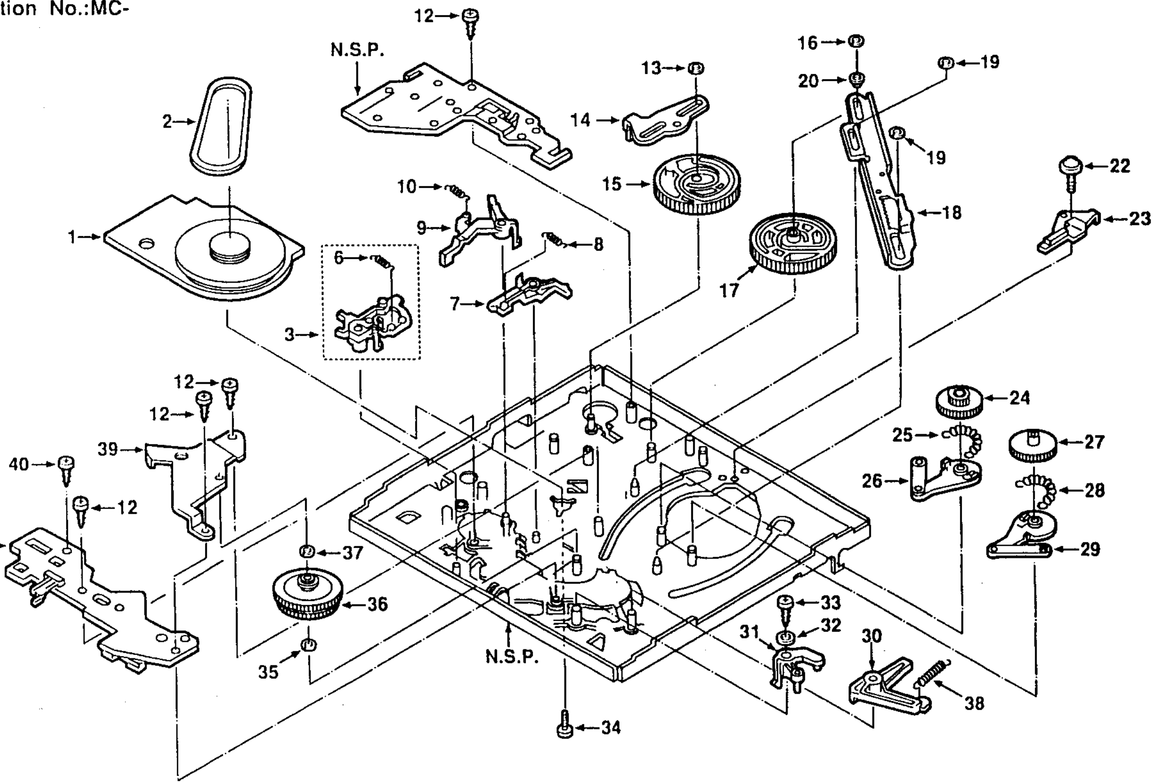

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95EA4/MC-3

N.S.P.:Not available as service parts
MECHANISM PARTS 3

ELECTRICAL PARTS

NOTE;

1. Materials of Capacitors and Resistors are abbreviated as follows;

Resistors	
MT-FILM	Metallized Film Resistor
MT-GLAZE	Metallized Glaze Resistor
OXIDE-MT	Oxide Metallized Film Resistor
Capacitors	
MT-POLYEST	Metallized Polyester Capacitor
MT-COMPO	Metallized Composite Capacitor
TA-SOLID	Tantalum Solid Capacitor
AL-SOLID	Aluminum Solid Capacitor
NP-ELECT	Non-Polarized Electrolytic Capacitor
OS-SOLID	Aluminum Solid Capacitors with Organic Semiconductive Electrolytic Capacitor
DL-ELECT	Double Layered Electrolytic Capacitor

2. Tolerance of Capacitor(10pF over) and Resistor are noted with follow symboles.
   F ············ ±1%　G ············ ±2%　J ············ ±5%　K ············ ±10%
   M ············ ±20%　N ············ ±30%　Z ············ +80% ~ −20%
3. Capacitors
   U : uF　P : pF
4. Inductors
   UH : uH　MH : mH
5. N.S.P. : Not available as service parts.

LOCATION	PARTS NO.	DESCRIPTION
COMPL.PWB CP-1-A		
COMPL.NO	613 166 5200	
(SEMICONDUCTORS)		
Q1001	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1002	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1003	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1004	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1005	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q1006	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1007	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1008	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1009	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q1101	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1102	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1103	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1104	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1201	405 023 5009	TR 2SD400-E-MP
OR	405 023 5306	TR 2SD400-F-MP
Q1202	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1202	405 002 0209	TR 2SA1037K-Q
Q1203	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1204	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1205	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q1206	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1207	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1208	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1209	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q1210	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1211	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1213	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1214	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1301	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q1302	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1401	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1402	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1403	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q

LOCATION	PARTS NO.	DESCRIPTION
Q1404	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1601	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1602	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1603	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q2001	405 018 0002	TR 2SC3331-S
OR	405 018 0101	TR 2SC3331-T
OR	405 018 0200	TR 2SC3331-U
Q2002	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2003	405 003 7207	TR 2SA1342
OR	405 000 1109	TR DTA124EK
Q2004	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2010	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2011	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2012	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2051	405 083 5209	TR DTC343TK
Q3003	405 023 5009	TR 2SD400-E-MP
OR	405 023 5306	TR 2SD400-F-MP
Q3004	405 099 8508	TR 2SC4640S
OR	405 099 8607	TR 2SC4640T
OR	405 011 8401	TR 2SC1740S-Q
OR	405 011 8500	TR 2SC1740S-R
Q3501	405 057 6409	TR 2SC4038-R
Q3602	405 029 3504	TR DTC144EK
Q3952	405 082 7204	TR 2SC4039 Q
Q3953	405 029 3504	TR DTC144EK
Q7301	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q7302	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q7303	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q7304	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q7305	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q7306	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q

(INTEGRATED CIRCUITS)

LOCATION	PARTS NO.	DESCRIPTION
IC101	409 369 2302	IC LC74781-9013
IC111	409 269 1900	IC LA7395
IC131	409 297 6205	IC LC89925
IC151	409 018 3902	IC LA6393D
IC161	409 143 7905	IC CXA1203M
IC201	409 262 2409	IC LA7285M
IC301	410 252 9605	IC UPD78138GF-046-3B9
IC302	409 313 1009	IC MN1381-R
OR	409 308 3902	IC MN1381-S
OR	409 243 4200	IC MN1380-R
OR	409 243 4309	IC MN1380-S
IC303	409 314 2005	IC LB1643
IC352	409 178 3200	IC LA7124
IC391	409 225 6109	IC BA7046

(DIODES)

LOCATION	PARTS NO.	DESCRIPTION
D1002	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D1102	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D1104	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D1105	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D1201	407 063 8903	ZENER DIODE MTZJ5.6C
D1202	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D2051	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3001	407 004 9709	DIODE DSK10C
OR	407 005 8701	DIODE ERA15-02
D3016	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3065	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3107	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3108	407 063 8903	ZENER DIODE MTZJ5.6C
D3505	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3506	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3507	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3954	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3956	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3957	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7302	407 012 4406	DIODE 1SS133
OR	407 007 9904	DIODE GMA01
D7303	407 012 4406	DIODE 1SS133
OR	407 007 9904	DIODE GMA01

(CRYSTAL DEVICES)

LOCATION	PARTS NO.	DESCRIPTION
X1001	613 002 8709	CRYSTAL 17.734475MHZ
OR	613 127 1555	OSC,CRYSTAL 17.734475MHZ
X1101	613 080 9407	OSC,CRYSTAL 4.43MHZ
OR	645 005 1197	OSC,CRYSTAL 4.433619MHZ
OR	613 120 8865	OSC,CRYSTAL 4.433619MHZ
X3001	613 113 7646	OSC,CRYSTAL 12MHZ
OR	613 123 0149	OSC,CRYSTAL 12MHZ

(VARIABLE RESISTORS)

LOCATION	PARTS NO.	DESCRIPTION
VR111	645 003 5265	VR,SEMI,22K N
OR	645 003 5456	VR,SEMI,22K N
VR112	645 003 5258	VR,SEMI,2.2K N
OR	645 003 5449	VR,SEMI,2.2K N

LOCATION	PARTS NO.	DESCRIPTION
VR113	645 003 5326	VR,SEMI,4.7K N
OR	645 003 5470	VR,SEMI,4.7K N
VR114	645 003 5197	VR,SEMI,10K N
OR	645 002 0919	VR,SEMI 10K N
VR201	645 003 5548	VR,SEMI,100K N
OR	645 001 8787	VR,SEMI,100K N
(INDUCTORS)		
L1003	645 006 3886	INDUCTOR,1U K
OR	645 005 3856	INDUCTOR,1U M
L1004	645 001 5458	INDUCTOR 27U J
OR	645 003 8051	INDUCTOR,27U J
L1101	645 001 4574	INDUCTOR 100U J
OR	645 003 7917	INDUCTOR,100U J
L1102	645 006 3886	INDUCTOR,1U K
OR	645 005 3856	INDUCTOR,1U M
L1103	645 002 1466	INDUCTOR 3.3U J
OR	645 003 8075	INDUCTOR,3.3U J
L1104	645 001 5441	INDUCTOR,2.2U K
OR	645 005 3887	INDUCTOR,2.2U M
L1105	645 003 8501	INDUCTOR,4.7U J
OR	645 003 8143	INDUCTOR,4.7U J
L1201	645 002 1442	INDUCTOR 18U J
OR	645 003 7986	INDUCTOR,18U J
L1202	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1203	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1204	645 002 1497	INDUCTOR 56U J
OR	645 003 8181	INDUCTOR,56U J
L1205	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1206	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1301	645 001 5533	INDUCTOR 82U J
OR	645 003 7610	INDUCTOR,82U J
L1402	645 001 4659	INDUCTOR 220U J
OR	645 003 8037	INDUCTOR,220U J
L1403	645 002 1435	INDUCTOR 150U J
OR	645 011 1556	INDUCTOR,150U J
L1405	645 001 5472	INDUCTOR 33U J
OR	645 003 8105	INDUCTOR,33U J
L1501	645 002 1428	INDUCTOR 15U J
OR	645 003 7955	INDUCTOR,15U J
L1502	645 001 5472	INDUCTOR 33U J
OR	645 003 8105	INDUCTOR,33U J
L1601	645 002 1411	INDUCTOR 10U J
OR	645 003 7894	INDUCTOR,10U J
L2001	613 130 3539	FERRITE CORE
OR	645 008 7936	CORE
L2002	645 009 0417	INDUCTOR,10.0M J
L2003	645 003 7238	INDUCTOR,560U J
(TRANSFORMERS)		
T2001	613 098 6023	TRANS,OSC 70KHZ
OR	621 019 9596	70KHZ OSC TRANS
(DELAY LINES)		
DL151	613 116 7001	DELAY,2H
OR	613 117 4870	DELAY,2H
(CAPACITORS)		
C1001	403 248 1905	ELECT 10U M 16V
C1002	403 069 5601	CERAMIC 0.01U K 50V
C1004	403 206 9004	ELECT 1000U M 6.3V
C1005	403 248 1608	ELECT 47U M 16V
C1006	403 069 5601	CERAMIC 0.01U K 50V

LOCATION	PARTS NO.	DESCRIPTION
C1008	403 248 2902	ELECT 47U M 6.3V
C1009	403 069 5601	CERAMIC 0.01U K 50V
C1010	403 248 1400	ELECT 1U M 50V
C1013	403 069 5601	CERAMIC 0.01U K 50V
C1014	403 248 2803	ELECT 2.2U M 50V
C1015	403 069 5601	CERAMIC 0.01U K 50V
C1016	403 248 2902	ELECT 47U M 6.3V
C1017	403 009 5807	CERAMIC 100P J 50V
C1018	403 009 5807	CERAMIC 100P J 50V
C1019	403 009 5807	CERAMIC 100P J 50V
C1020	403 018 0602	CERAMIC 22P J 50V
C1021	403 018 0602	CERAMIC 22P J 50V
C1022	403 010 8606	CERAMIC 12P J 50V
C1023	403 010 8606	CERAMIC 12P J 50V
C1024	403 233 1507	ELECT 4.7U M 50V
C1026	403 025 1708	CERAMIC 4P C 50V
C1101	403 010 8606	CERAMIC 12P J 50V
C1103	403 257 0807	ELECT 0.47U M 50V
C1105	403 024 7206	CERAMIC 390P J 50V
C1106	403 269 3209	CERAMIC 4.7P C 50V
C1107	403 033 4609	CERAMIC 82P J 50V
C1108	403 248 1905	ELECT 10U M 16V
C1109	403 248 1905	ELECT 10U M 16V
C1110	403 028 9909	CERAMIC 560P J 50V
C1111	403 257 0807	ELECT 0.47U M 50V
C1112	403 069 5601	CERAMIC 0.01U K 50V
C1114	403 020 5602	CERAMIC 270P J 50V
C1115	403 248 1400	ELECT 1U M 50V
C1116	403 248 1400	ELECT 1U M 50V
C1117	403 130 3109	CERAMIC 0.047U K 50V
C1118	403 072 1607	CERAMIC 0.022U K 50V
C1119	403 032 2309	CERAMIC 75P J 50V
C1120	403 069 5601	CERAMIC 0.01U K 50V
C1121	403 069 5601	CERAMIC 0.01U K 50V
C1123	403 248 2803	ELECT 2.2U M 50V
C1125	403 248 1400	ELECT 1U M 50V
C1126	403 072 1607	CERAMIC 0.022U K 50V
C1127	403 069 5601	CERAMIC 0.01U K 50V
C1128	403 248 1905	ELECT 10U M 16V
C1129	403 130 3109	CERAMIC 0.047U K 50V
C1130	403 070 2606	CERAMIC 0.1U Z 50V
C1131	403 248 2902	ELECT 47U M 6.3V
C1132	403 248 1905	ELECT 10U M 16V
C1133	403 248 1905	ELECT 10U M 16V
C1134	403 069 5601	CERAMIC 0.01U K 50V
C1135	403 012 6907	CERAMIC 15P J 50V
C1140	403 070 2606	CERAMIC 0.1U Z 50V
C1141	403 020 0508	CERAMIC 27P J 50V
C1146	403 018 0602	CERAMIC 22P J 50V
C1147	403 119 6701	CERAMIC 0.068U K 16V
C1148	403 114 5907	CERAMIC 0.082U K 16V
C1201	403 070 2606	CERAMIC 0.1U Z 50V
C1203	403 018 7502	CERAMIC 220P J 50V
C1204	403 022 8304	CERAMIC 33P J 50V
C1205	403 022 8304	CERAMIC 33P J 50V
C1206	403 069 5601	CERAMIC 0.01U K 50V
C1207	403 026 2902	CERAMIC 47P J 50V
C1209	403 022 8304	CERAMIC 33P J 50V
C1211	403 022 8304	CERAMIC 33P J 50V
C1212	403 026 2902	CERAMIC 47P J 50V
C1213	403 069 5601	CERAMIC 0.01U K 50V
C1214	403 020 0508	CERAMIC 27P J 50V
C1216	403 018 0602	CERAMIC 22P J 50V
C1217	403 012 6907	CERAMIC 15P J 50V
C1219	403 069 5601	CERAMIC 0.01U K 50V
C1220	403 258 2602	ELECT 100U M 6.3V
C1224	403 072 5902	CERAMIC 0.027U K 50V
C1301	403 069 5601	CERAMIC 0.01U K 50V
C1302	403 069 5601	CERAMIC 0.01U K 50V

LOCATION	PARTS NO.	DESCRIPTION
R1104	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R1105	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1106	401 038 9001	MT-GLAZE 680 JA 1/10W
R1107	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1108	401 037 5202	MT-GLAZE 100 JA 1/10W
R1109	401 012 9201	CARBON 1M JA 1/4W
R1110	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1111	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1112	401 037 8005	MT-GLAZE 15K JA 1/10W
R1113	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R1115	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1116	401 038 0800	MT-GLAZE 22K JA 1/10W
R1118	401 038 0800	MT-GLAZE 22K JA 1/10W
R1119	401 037 5400	MT-GLAZE 1K JA 1/10W
R1120	401 038 3405	MT-GLAZE 33 JA 1/10W
R1122	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R1123	401 038 3504	MT-GLAZE 330 JA 1/10W
R1124	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1125	401 037 6803	MT-GLAZE 12K JA 1/10W
R1126	401 038 3702	MT-GLAZE 33K JA 1/10W
R1127	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1128	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1133	401 038 0800	MT-GLAZE 22K JA 1/10W
R1134	401 038 0800	MT-GLAZE 22K JA 1/10W
R1201	401 038 9001	MT-GLAZE 680 JA 1/10W
R1202	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1203	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1204	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1205	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1206	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1207	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1209	401 038 7601	MT-GLAZE 560 JA 1/10W
R1210	401 038 3504	MT-GLAZE 330 JA 1/10W
R1211	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1212	401 039 0304	MT-GLAZE 820 JA 1/10W
R1213	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1214	401 037 5400	MT-GLAZE 1K JA 1/10W
R1215	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1216	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1217	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1218	401 037 5400	MT-GLAZE 1K JA 1/10W
R1219	401 038 7601	MT-GLAZE 560 JA 1/10W
R1220	401 038 5003	MT-GLAZE 390 JA 1/10W
R1221	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1222	401 039 0304	MT-GLAZE 820 JA 1/10W
R1223	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1227	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1228	401 037 5608	MT-GLAZE 10K JA 1/10W
R1229	401 038 0800	MT-GLAZE 22K JA 1/10W
R1230	401 037 5400	MT-GLAZE 1K JA 1/10W
R1231	401 037 5608	MT-GLAZE 10K JA 1/10W
R1301	401 038 7601	MT-GLAZE 560 JA 1/10W
R1302	401 037 5400	MT-GLAZE 1K JA 1/10W
R1303	401 037 5400	MT-GLAZE 1K JA 1/10W
R1304	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1401	401 038 0800	MT-GLAZE 22K JA 1/10W
R1402	401 038 0800	MT-GLAZE 22K JA 1/10W
R1403	401 037 5400	MT-GLAZE 1K JA 1/10W
R1404	401 037 5400	MT-GLAZE 1K JA 1/10W
R1405	401 039 0304	MT-GLAZE 820 JA 1/10W
R1406	401 037 5400	MT-GLAZE 1K JA 1/10W
R1408	401 037 5400	MT-GLAZE 1K JA 1/10W
R1409	401 037 5400	MT-GLAZE 1K JA 1/10W
R1410	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1501	401 038 3801	MT-GLAZE 330K JA 1/10W
R1502	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1503	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1504	401 037 5608	MT-GLAZE 10K JA 1/10W
R1505	401 037 5608	MT-GLAZE 10K JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R1506	401 038 6307	MT-GLAZE 470 JA 1/10W
R1507	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1601	401 038 6307	MT-GLAZE 470 JA 1/10W
R1603	401 039 0304	MT-GLAZE 820 JA 1/10W
R1604	401 038 7601	MT-GLAZE 560 JA 1/10W
R1606	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1607	401 037 5608	MT-GLAZE 10K JA 1/10W
R1608	401 038 0800	MT-GLAZE 22K JA 1/10W
R1610	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1611	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1612	401 038 3801	MT-GLAZE 330K JA 1/10W
R1613	401 037 8104	MT-GLAZE 150K JA 1/10W
R1614	401 038 3504	MT-GLAZE 330 JA 1/10W
R1615	401 037 5707	MT-GLAZE 100K JA 1/10W
R1616	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1617	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1618	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1619	401 038 2002	MT-GLAZE 270 JA 1/10W
R1621	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R2001	401 037 5202	MT-GLAZE 100 JA 1/10W
R2002	401 038 6505	MT-GLAZE 47K JA 1/10W
R2003	401 037 7206	MT-GLAZE 130 JA 1/10W
R2004	401 038 3801	MT-GLAZE 330K JA 1/10W
R2005	401 037 5608	MT-GLAZE 10K JA 1/10W
R2009	401 037 5806	MT-GLAZE 1M JA 1/10W
R2010	401 037 8005	MT-GLAZE 15K JA 1/10W
R2011	401 037 5608	MT-GLAZE 10K JA 1/10W
R2012	401 037 8005	MT-GLAZE 15K JA 1/10W
R2013	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R2014	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R2018	401 038 0800	MT-GLAZE 22K JA 1/10W
R2021	401 038 3405	MT-GLAZE 33 JA 1/10W
R2022	401 038 6208	MT-GLAZE 47 JA 1/10W
R2023	401 037 8005	MT-GLAZE 15K JA 1/10W
R2024	401 038 8103	MT-GLAZE 6.8 JA 1/10W
R2035	401 037 5608	MT-GLAZE 10K JA 1/10W
R2037	401 037 5608	MT-GLAZE 10K JA 1/10W
R2038	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R2042	401 037 5707	MT-GLAZE 100K JA 1/10W
R2050	401 038 0602	MT-GLAZE 220 JA 1/10W
R2051	401 037 5608	MT-GLAZE 10K JA 1/10W
R2071	401 037 5202	MT-GLAZE 100 JA 1/10W
R2091	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R2094	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R2095	401 037 5608	MT-GLAZE 10K JA 1/10W
R2101	401 038 7809	MT-GLAZE 56K JA 1/10W
R2102	401 037 8005	MT-GLAZE 15K JA 1/10W
R2105	401 038 7601	MT-GLAZE 560 JA 1/10W
R2106	401 038 7601	MT-GLAZE 560 JA 1/10W
R3020	401 037 5608	MT-GLAZE 10K JA 1/10W
R3021	401 037 5400	MT-GLAZE 1K JA 1/10W
R3022	401 037 5400	MT-GLAZE 1K JA 1/10W
R3031	401 037 5400	MT-GLAZE 1K JA 1/10W
R3032	401 037 5400	MT-GLAZE 1K JA 1/10W
R3033	401 037 5400	MT-GLAZE 1K JA 1/10W
R3034	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3035	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3036	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3041	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3042	401 038 0305	MT-GLAZE 200K JA 1/10W
R3043	401 038 0305	MT-GLAZE 200K JA 1/10W
R3044	401 037 5400	MT-GLAZE 1K JA 1/10W
R3045	401 037 5400	MT-GLAZE 1K JA 1/10W
R3046	401 037 5400	MT-GLAZE 1K JA 1/10W
R3051	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3052	401 037 5400	MT-GLAZE 1K JA 1/10W
R3055	401 037 5400	MT-GLAZE 1K JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION			
C1303	403 248 2902	ELECT	47U	M	6.3V
C1304	403 248 1400	ELECT	1U	M	50V
~~C1306~~	~~403 269 3209~~	~~CERAMIC~~	~~4.7P~~	~~C~~	~~50V~~
C1307	403 026 2902	CERAMIC	47P	J	50V
C1308	403 026 2902	CERAMIC	47P	J	50V
C1401	403 069 5601	CERAMIC	0.01U	K	50V
C1402	403 069 5601	CERAMIC	0.01U	K	50V
C1404	403 030 7009	CERAMIC	68P	J	50V
C1405	403 024 7206	CERAMIC	390P	J	50V
C1406	403 074 3104	CERAMIC	0.047U	Z	50V
C1408	403 069 5601	CERAMIC	0.01U	K	50V
C1409	403 233 1507	ELECT	4.7U	M	50V
C1410	403 014 9302	CERAMIC	180P	J	50V
C1411	403 069 5601	CERAMIC	0.01U	K	50V
C1412	403 069 5601	CERAMIC	0.01U	K	50V
C1501	403 072 1607	CERAMIC	0.022U	K	50V
C1503	403 069 5601	CERAMIC	0.01U	K	50V
C1504	403 018 0602	CERAMIC	22P	J	50V
C1505	403 069 5601	CERAMIC	0.01U	K	50V
C1601	403 248 2902	ELECT	47U	M	6.3V
C1602	403 069 5601	CERAMIC	0.01U	K	50V
C1603	403 009 5807	CERAMIC	100P	J	50V
C1604	403 018 0602	CERAMIC	22P	J	50V
C1605	403 010 1102	CERAMIC	1000P	J	50V
C1606	403 233 1507	ELECT	4.7U	M	50V
C1608	403 069 5601	CERAMIC	0.01U	K	50V
C1610	403 010 8606	CERAMIC	12P	J	50V
C1611	403 026 2902	CERAMIC	47P	J	50V
C1612	403 013 5800	CERAMIC	1500P	J	50V
C1613	403 248 1905	ELECT	10U	M	16V
C1614	403 028 4201	CERAMIC	56P	J	50V
C2003	403 121 3408	ELECT	2.2U	M	50V
C2004	403 107 9905	ELECT	10U	M	16V
C2005	403 001 1609	CERAMIC	0.01U	K	16V
C2006	403 018 0602	CERAMIC	22P	J	50V
C2009	403 121 2401	ELECT	22U	M	16V
C2010	403 134 9602	ELECT	47U	M	16V
C2013	403 070 9803	CERAMIC	0.015U	K	50V
C2016	403 191 8600	ELECT	4.7U	M	25V
C2017	403 189 2405	ELECT	10U	M	16V
C2019	403 163 8409	ELECT	47U	M	16V
C2020	403 071 6504	CERAMIC	220P	K	50V
C2021	403 082 4209	POLYPRO	6800P	J	100V
C2022	403 069 5601	CERAMIC	0.01U	K	50V
C2024	403 069 5601	CERAMIC	0.01U	K	50V
C2030	403 107 9905	ELECT	10U	M	16V
C2031	403 193 8400	ELECT	0.22U	M	50V
C2033	403 072 1607	CERAMIC	0.022U	K	50V
C2051	403 111 8000	CERAMIC	1200P	J	50V
C2071	403 114 5907	CERAMIC	0.082U	K	16V
C2072	403 135 3708	ELECT	33U	M	6.3V
C2073	403 193 8608	ELECT	0.47U	M	50V
C2091	403 070 2606	CERAMIC	0.1U	Z	50V
C2092	403 073 0005	CERAMIC	3300P	K	50V
C2101	403 070 2606	CERAMIC	0.1U	Z	50V
C3002	403 069 1702	CERAMIC	1000P	K	50V
C3006	403 014 3508	CERAMIC	18P	J	50V
C3007	403 014 3508	CERAMIC	18P	J	50V
C3041	403 069 5601	CERAMIC	0.01U	K	50V
C3042	403 069 5601	CERAMIC	0.01U	K	50V
C3071	403 107 9905	ELECT	10U	M	16V
C3072	403 069 5601	CERAMIC	0.01U	K	50V
C3073	403 069 5601	CERAMIC	0.01U	K	50V
C3074	403 134 8100	ELECT	100U	M	6.3V
C3075	403 069 5601	CERAMIC	0.01U	K	50V
C3076	403 069 5601	CERAMIC	0.01U	K	50V
C3082	403 070 2606	CERAMIC	0.1U	Z	50V

LOCATION	PARTS NO.	DESCRIPTION			
C3083	403 121 3408	ELECT	2.2U	M	50V
C3092	403 071 6504	CERAMIC	220P	K	50V
~~C3101~~	~~403 135 4101~~	~~ELECT~~	~~470U~~	~~M~~	~~6.3V~~
C3104	403 069 5601	CERAMIC	0.01U	K	50V
C3106	403 168 6103	MT-POLYEST	0.1U	J	50V
C3503	403 069 5601	CERAMIC	0.01U	K	50V
C3504	403 072 5605	CERAMIC	2700P	K	50V
C3506	403 072 1607	CERAMIC	0.022U	K	50V
C3509	403 072 8507	CERAMIC	330P	K	50V
C3515	403 107 9905	ELECT	10U	M	16V
C3516	403 135 7805	ELECT	3.3U	M	50V
C3517	403 074 9502	CERAMIC	680P	K	50V
C3518	403 166 1506	NP-ELECT	47U	M	16V
C3519	403 069 1702	CERAMIC	1000P	K	50V
C3524	403 154 2102	NP-ELECT	1U	M	50V
C3525	403 069 5601	CERAMIC	0.01U	K	50V
C3526	403 154 2102	NP-ELECT	1U	M	50V
C3527	403 069 5601	CERAMIC	0.01U	K	50V
C3528	403 108 0000	ELECT	0.22U	M	50V
C3529	403 069 5601	CERAMIC	0.01U	K	50V
C3530	403 109 6308	ELECT	1U	M	50V
C3531	403 069 5601	CERAMIC	0.01U	K	50V
C3538	403 135 4002	ELECT	47U	M	6.3V
C3539	403 135 4002	ELECT	47U	M	6.3V
C3545	403 069 1702	CERAMIC	1000P	K	50V
C3546	403 071 6504	CERAMIC	220P	K	50V
C3550	403 119 6701	CERAMIC	0.068U	K	16V
C3551	403 069 1702	CERAMIC	1000P	K	50V
C3951	403 059 3006	POLYESTER	2200P	J	50V
C3952	403 109 6308	ELECT	1U	M	50V
C3953	403 135 4002	ELECT	47U	M	6.3V
C3954	403 072 1607	CERAMIC	0.022U	K	50V
C3955	403 009 5708	CERAMIC	100P	J	50V
C3957	403 069 1702	CERAMIC	1000P	K	50V
C7301	403 010 1102	CERAMIC	1000P	J	50V
C7302	403 010 1102	CERAMIC	1000P	J	50V

(RESISTORS)

LOCATION	PARTS NO.	DESCRIPTION			
R1001	401 038 9308	MT-GLAZE	68K	JA	1/10W
R1002	401 038 7809	MT-GLAZE	56K	JA	1/10W
R1003	401 039 0403	MT-GLAZE	8.2K	JA	1/10W
R1004	401 038 9001	MT-GLAZE	680	JA	1/10W
R1005	401 039 0403	MT-GLAZE	8.2K	JA	1/10W
R1006	401 038 2101	MT-GLAZE	2.7K	JA	1/10W
R1007	401 038 2101	MT-GLAZE	2.7K	JA	1/10W
R1008	401 037 7909	MT-GLAZE	1.5K	JA	1/10W
R1009	401 037 5400	MT-GLAZE	1K	JA	1/10W
R1011	401 038 9506	MT-GLAZE	75	JA	1/10W
R1012	401 037 7909	MT-GLAZE	1.5K	JA	1/10W
R1013	401 037 7909	MT-GLAZE	1.5K	JA	1/10W
R1014	401 037 5400	MT-GLAZE	1K	JA	1/10W
R1017	401 038 7700	MT-GLAZE	5.6K	JA	1/10W
R1018	401 038 0800	MT-GLAZE	22K	JA	1/10W
R1019	401 037 5608	MT-GLAZE	10K	JA	1/10W
R1020	401 037 5400	MT-GLAZE	1K	JA	1/10W
R1021	401 037 5400	MT-GLAZE	1K	JA	1/10W
R1022	401 037 5400	MT-GLAZE	1K	JA	1/10W
R1023	401 038 3603	MT-GLAZE	3.3K	JA	1/10W
R1024	401 037 6704	MT-GLAZE	1.2K	JA	1/10W
R1025	401 038 7908	MT-GLAZE	560K	JA	1/10W
R1026	401 037 7800	MT-GLAZE	150	JA	1/10W
R1027	401 037 7800	MT-GLAZE	150	JA	1/10W
R1028	401 037 7909	MT-GLAZE	1.5K	JA	1/10W
R1031	401 038 7601	MT-GLAZE	560	JA	1/10W
R1101	401 038 5102	MT-GLAZE	3.9K	JA	1/10W
R1102	401 037 7909	MT-GLAZE	1.5K	JA	1/10W
R1103	401 038 2101	MT-GLAZE	2.7K	JA	1/10W

LOCATION	PARTS NO.	DESCRIPTION
R3059	401 038 6505	MT-GLAZE 47K JA 1/10W
R3065	401 038 2200	MT-GLAZE 27K JA 1/10W
~~R3066~~	~~401 038 0701~~	~~MT-GLAZE 2.2K JA 1/10W~~
R3067	401 037 5400	MT-GLAZE 1K JA 1/10W
R3068	401 039 0601	MT-GLAZE 820K JA 1/10W
R3070	401 038 2309	MT-GLAZE 270K JA 1/10W
R3071	401 038 9605	MT-GLAZE 750 JA 1/10W
R3080 ⚠	402 036 3701	FUSIBLE RES 3.3 JA 1/2W
R3081	401 037 5608	MT-GLAZE 10K JA 1/10W
R3082	401 037 5608	MT-GLAZE 10K JA 1/10W
R3083	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3084	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R3085	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R3087	401 037 5608	MT-GLAZE 10K JA 1/10W
R3088	401 037 5608	MT-GLAZE 10K JA 1/10W
R3103	401 048 6106	MT-FILM 470 FD 1/4W
R3104	401 107 5903	MT-FILM 1.3K FD 1/4W
R3105	401 038 2200	MT-GLAZE 27K JA 1/10W
R3503	401 037 5707	MT-GLAZE 100K JA 1/10W
R3504	401 037 9309	MT-GLAZE 18K JA 1/10W
R3505	401 038 2200	MT-GLAZE 27K JA 1/10W
R3506	401 037 5707	MT-GLAZE 100K JA 1/10W
R3507	401 037 5707	MT-GLAZE 100K JA 1/10W
R3509	401 037 5608	MT-GLAZE 10K JA 1/10W
R3510	401 037 5707	MT-GLAZE 100K JA 1/10W
R3511	401 037 5400	MT-GLAZE 1K JA 1/10W
R3520	401 038 8806	MT-GLAZE 620K JA 1/10W
R3521	401 038 9902	MT-GLAZE 750K JA 1/10W
R3522	401 038 6604	MT-GLAZE 470K JA 1/10W
R3523	401 037 5707	MT-GLAZE 100K JA 1/10W
R3524	401 037 5707	MT-GLAZE 100K JA 1/10W
R3525	401 038 4006	MT-GLAZE 360 JA 1/10W
R3526	401 038 7106	MT-GLAZE 510 JA 1/10W
R3527	401 038 7106	MT-GLAZE 510 JA 1/10W
R3529	401 037 5608	MT-GLAZE 10K JA 1/10W
R3530	401 037 5400	MT-GLAZE 1K JA 1/10W
R3531	401 037 5400	MT-GLAZE 1K JA 1/10W
R3532	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3533	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3537	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R3538	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R3556	401 037 5400	MT-GLAZE 1K JA 1/10W
R3557	401 037 5400	MT-GLAZE 1K JA 1/10W
R3567	401 037 5608	MT-GLAZE 10K JA 1/10W
R3569	401 037 5608	MT-GLAZE 10K JA 1/10W
R3615	401 037 9408	MT-GLAZE 180K JA 1/10W
R3616	401 037 8104	MT-GLAZE 150K JA 1/10W
R3952	401 107 8003	MT-FILM 130K FD 1/4W
R3953	401 037 5608	MT-GLAZE 10K JA 1/10W
R3956	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R3957	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R3958	401 037 5707	MT-GLAZE 100K JA 1/10W
R3959	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3962	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R3963	401 038 6604	MT-GLAZE 470K JA 1/10W
R3965	401 037 5400	MT-GLAZE 1K JA 1/10W
R3994	401 037 5608	MT-GLAZE 10K JA 1/10W
R3995	401 037 5608	MT-GLAZE 10K JA 1/10W
R7301	401 037 5608	MT-GLAZE 10K JA 1/10W
R7302	401 037 5608	MT-GLAZE 10K JA 1/10W
R7303	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7305	401 037 5400	MT-GLAZE 1K JA 1/10W
R7306	401 037 5608	MT-GLAZE 10K JA 1/10W
R7307	401 037 5608	MT-GLAZE 10K JA 1/10W
R7308	401 037 5608	MT-GLAZE 10K JA 1/10W
R7309	401 037 5608	MT-GLAZE 10K JA 1/10W
R7310	401 037 5608	MT-GLAZE 10K JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R7311	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7313	401 037 5608	MT-GLAZE 10K JA 1/10W
~~R7314~~	~~401 037 5608~~	~~MT-GLAZE 10K JA 1/10W~~
R7315	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7317	401 037 5400	MT-GLAZE 1K JA 1/10W
R7318	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7319	401 037 5608	MT-GLAZE 10K JA 1/10W
R7320	401 037 5608	MT-GLAZE 10K JA 1/10W
R7323	401 037 5608	MT-GLAZE 10K JA 1/10W
R7324	401 037 5608	MT-GLAZE 10K JA 1/10W
R7325	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7332	401 038 6406	MT-GLAZE 4.7K JA 1/10W

(JUMPERS)

J1104	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1203	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1414	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1501	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1503	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1601	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1602	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1612	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1614	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J7301	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J7325	401 037 5004	MT-GLAZE 0.000 ZA 1/10W

(MISCELLANEOUS)

	613 027 4281	TUBE
	645 008 8070	FIXER
Z3102 ⚠	645 008 5765	BATTERY,RECHARGE

CAUTION

Danger of explosion if battery is incorrectly replaced.
Replace only with the same or equivalent type recommended by the manufacturer.
Discard used batteries according to the manufacturer's instructions.

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COMPL PWB,VP-1

COMPL.NO 613 166 4630

(SEMICONDUCTORS)

Q1801	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q1802	405 015 9701	TR 2SC2814-F4
OR	405 015 9909	TR 2SC2814-F5
OR	405 035 6100	TR 2SC2413K-Q
Q1803	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1804	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q1805	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1806	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
OR	405 002 0209	TR 2SA1037K-Q
Q1807	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1808	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
OR	405 014 4400	TR 2SC2412K-Q
Q1809	405 018 1900	TR 2SC3395

LOCATION	PARTS NO.	DESCRIPTION
Q1809	405 029 3504	TR DTC144EK

(INTEGRATED CIRCUIT)

LOCATION	PARTS NO.	DESCRIPTION
IC181	409 262 2003	IC LA7374

(DIODES)

LOCATION	PARTS NO.	DESCRIPTION
D1801	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133

(VARIABLE RESISTORS)

LOCATION	PARTS NO.	DESCRIPTION
VR181	645 003 5685	VR,SEMI,2.2K N
OR	645 003 5142	VR,SEMI,2.2K N

(INDUCTORS)

LOCATION	PARTS NO.	DESCRIPTION
L1801	645 001 5502	INDUCTOR 47U J
OR	645 003 8150	INDUCTOR,47U J
L1802	645 002 1428	INDUCTOR 15U J
OR	645 003 7955	INDUCTOR,15U J
L1803	645 002 1428	INDUCTOR 15U J
OR	645 003 7955	INDUCTOR,15U J
L1804	645 001 4659	INDUCTOR 220U J
OR	645 003 8037	INDUCTOR,220U J
L1805	645 002 1480	INDUCTOR 5.6U J
OR	645 003 8167	INDUCTOR,5.6U J
L1806	645 002 1442	INDUCTOR 18U J
OR	645 003 7986	INDUCTOR,18U J
L1807	645 002 1435	INDUCTOR 150U J
OR	645 011 1556	INDUCTOR,150U J
L1808	645 002 1510	INDUCTOR 68U J
OR	645 003 8228	INDUCTOR,68U J

(CAPACITORS)

LOCATION	PARTS NO.	DESCRIPTION		
C1801	403 074 3104	CERAMIC	0.047U Z	50V
C1802	403 074 3104	CERAMIC	0.047U Z	50V
C1803	403 074 3104	CERAMIC	0.047U Z	50V
C1804	403 074 3104	CERAMIC	0.047U Z	50V
C1805	403 069 5601	CERAMIC	0.01U K	50V
C1806	403 069 5601	CERAMIC	0.01U K	50V
C1807	403 069 5601	CERAMIC	0.01U K	50V
C1808	403 193 8509	ELECT	0.33U M	50V
C1809	403 069 5601	CERAMIC	0.01U K	50V
C1810	403 069 5601	CERAMIC	0.01U K	50V
C1811	403 154 3307	OS-SOLID	4.7U M	10V
C1812	403 070 9803	CERAMIC	0.015U K	50V
C1813	403 069 5601	CERAMIC	0.01U K	50V
C1814	403 069 5601	CERAMIC	0.01U K	50V
C1815	403 022 8304	CERAMIC	33P J	50V
C1816	403 022 8304	CERAMIC	33P J	50V
C1817	403 028 4201	CERAMIC	56P J	50V
C1818	403 026 2902	CERAMIC	47P J	50V
C1819	403 023 4503	CERAMIC	330P J	50V
C1820	403 069 5601	CERAMIC	0.01U K	50V
C1821	403 163 7907	ELECT	47U M	6.3V
C1822	403 069 5601	CERAMIC	0.01U K	50V
C1824	403 020 0508	CERAMIC	27P J	50V
C1825	403 008 7505	CERAMIC	10P D	50V
C1826	403 069 5601	CERAMIC	0.01U K	50V
C1827	403 069 5601	CERAMIC	0.01U K	50V
C1828	403 069 5601	CERAMIC	0.01U K	50V
C1830	403 014 9302	CERAMIC	180P J	50V
C1831	403 013 3103	CERAMIC	150P J	50V
C1839	403 031 9309	CERAMIC	7P D	50V

(RESISTORS)

LOCATION	PARTS NO.	DESCRIPTION		
R1801	401 038 0701	MT-GLAZE	2.2K JA	1/10W
R1802	401 038 3702	MT-GLAZE	33K JA	1/10W
R1803	401 038 9209	MT-GLAZE	6.8K JA	1/10W
R1804	401 037 5400	MT-GLAZE	1K JA	1/10W
R1805	401 037 6803	MT-GLAZE	12K JA	1/10W
R1806	401 038 7700	MT-GLAZE	5.6K JA	1/10W
R1807	401 038 0800	MT-GLAZE	22K JA	1/10W
R1808	401 037 5400	MT-GLAZE	1K JA	1/10W
R1809	401 037 5400	MT-GLAZE	1K JA	1/10W
R1810	401 037 9200	MT-GLAZE	1.8K JA	1/10W
R1811	401 037 9200	MT-GLAZE	1.8K JA	1/10W
R1812	401 038 9001	MT-GLAZE	680 JA	1/10W
R1813	401 038 9001	MT-GLAZE	680 JA	1/10W
R1814	401 037 7909	MT-GLAZE	1.5K JA	1/10W
R1815	401 038 9605	MT-GLAZE	750 JA	1/10W
R1816	401 039 0304	MT-GLAZE	820 JA	1/10W
R1817	401 039 0304	MT-GLAZE	820 JA	1/10W
R1818	401 038 5003	MT-GLAZE	390 JA	1/10W
R1819	401 037 5400	MT-GLAZE	1K JA	1/10W
R1820	401 037 9200	MT-GLAZE	1.8K JA	1/10W
R1821	401 037 5400	MT-GLAZE	1K JA	1/10W
R1822	401 038 7601	MT-GLAZE	560 JA	1/10W
R1823	401 037 5400	MT-GLAZE	1K JA	1/10W
R1824	401 037 5400	MT-GLAZE	1K JA	1/10W
R1825	401 039 0304	MT-GLAZE	820 JA	1/10W
R1826	401 038 7700	MT-GLAZE	5.6K JA	1/10W
R1827	401 038 3603	MT-GLAZE	3.3K JA	1/10W
R1828	401 038 7601	MT-GLAZE	560 JA	1/10W
R1829	401 038 3603	MT-GLAZE	3.3K JA	1/10W
R1830	401 038 9209	MT-GLAZE	6.8K JA	1/10W
R1831	401 037 7909	MT-GLAZE	1.5K JA	1/10W
R1832	401 037 5400	MT-GLAZE	1K JA	1/10W
R1833	401 037 5400	MT-GLAZE	1K JA	1/10W

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COMPL PWB,TM-1

COMPL.NO 613 166 4579

(SEMICONDUCTOR)

LOCATION	PARTS NO.	DESCRIPTION
Q7101	405 063 9708	TR DTC144EL

(INTEGRATED CIRCUITS)

LOCATION	PARTS NO.	DESCRIPTION
IC711	410 252 9308	IC M38112M4-162SP
IC712	409 329 6302	IC MN1381
IC714	410 172 6807	IC X24C02PC7189
OR	409 348 6802	IC XL24C02P
OR	410 177 3603	IC AT24C02-10PC
OR	410 189 5701	IC 24LC02B/P

(DIODES)

LOCATION	PARTS NO.	DESCRIPTION
D7101	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7102	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7103	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7104	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7105	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7106	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713

LOCATION	PARTS NO.	DESCRIPTION
D7106	407 151 2905	DIODE WG713A
D7109	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7111	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7113	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7115	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7116	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7119	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7121	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7122	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7123	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7125	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
OR	407 142 0804	DIODE WG713
OR	407 151 2905	DIODE WG713A
D7131	407 097 0201	LED PR5505S,REPEAT

(CRYSTAL DEVICES)

X7101	645 006 3435	OSC,CERAMIC 4.000MHZ
OR	613 124 2142	RESONATOR,CERAMIC 4MHZ
X7102	613 109 0972	OSC,CRYSTAL 32KHZ
OR	645 004 1938	OSC,CRYSTAL 32.768KHZ

(VARIABLE RESISTOR)

VR711	645 007 1386	VR,ROTARY 1KB

(CAPACITORS)

C7101	403 009 1700	CERAMIC 10P J 50V
C7102	403 009 1700	CERAMIC 10P J 50V
C7103	403 014 2501	CERAMIC 18P J 50V
C7104	403 001 1609	CERAMIC 0.01U K 16V
C7105	403 139 0802	ELECT 22U M 6.3V
C7106	403 001 1609	CERAMIC 0.01U K 16V
C7107	403 001 1609	CERAMIC 0.01U K 16V
C7108	403 001 1609	CERAMIC 0.01U K 16V
C7110	403 001 1609	CERAMIC 0.01U K 16V
C7111	403 139 1007	ELECT 47U M 6.3V
C7112	403 121 9509	CERAMIC 0.1U Z 50V

(RESISTORS)

R7101	401 110 6201	CARBON 10M JA 1/4W
R7102	401 018 5702	CARBON 330K JA 1/4W
R7103	401 012 5609	CARBON 1K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R7104	401 022 1806	CARBON 680 JA 1/4W
R7105	401 012 5609	CARBON 1K JA 1/4W
R7106	401 012 5609	CARBON 1K JA 1/4W
R7107	401 012 5609	CARBON 1K JA 1/4W
R7108	401 012 5609	CARBON 1K JA 1/4W
R7109	401 012 5609	CARBON 1K JA 1/4W
R7110	401 012 5609	CARBON 1K JA 1/4W
R7111	401 012 6903	CARBON 10K JA 1/4W
R7112	401 012 6903	CARBON 10K JA 1/4W
R7113	401 012 6903	CARBON 10K JA 1/4W
R7114	401 012 6903	CARBON 10K JA 1/4W
R7121	401 012 6903	CARBON 10K JA 1/4W
R7122	401 012 6903	CARBON 10K JA 1/4W
R7123	401 017 0708	CARBON 270 JA 1/4W
R7124	401 014 4006	CARBON 1.5K JA 1/4W
R7125	401 014 4006	CARBON 1.5K JA 1/4W

(SWITCHES)

S7101	645 006 2797	SWITCH,PUSH 1P-1T,POWER
OR	645 008 8049	SWITCH,PUSH 1P-1T,POWER
S7102	645 006 2797	SWITCH,PUSH 1P-1T,TIMER
OR	645 008 8049	SWITCH,PUSH 1P-1T,TIMER
S7104	645 006 2797	SWITCH,PUSH 1P-1T,MENU RESET
OR	645 008 8049	SWITCH,PUSH 1P-1T,MENU RESET
S7105	645 006 2797	SWITCH,PUSH 1P-1T,SHIFT RIGHT
OR	645 008 8049	SWITCH,PUSH 1P-1T,SHIFT RIGHT
S7106	645 006 2797	SWITCH,PUSH 1P-1T,SHIFT DOWN
OR	645 008 8049	SWITCH,PUSH 1P-1T,SHIFT DOWN
S7107	645 006 2797	SWITCH,PUSH 1P-1T,MENU
OR	645 008 8049	SWITCH,PUSH 1P-1T,MENU
S7108	645 006 2797	SWITCH,PUSH 1P-1T,SEARCH/AD PLAY
OR	645 008 8049	SWITCH,PUSH 1P-1T,SEARCH/AD PLAY
S7109	645 006 2797	SWITCH,PUSH 1P-1T,R/P SPEED UP
OR	645 008 8049	SWITCH,PUSH 1P-1T,R/P SPEED UP
S7110	645 006 2797	SWITCH,PUSH 1P-1T,R/P SPEED DOWN
OR	645 008 8049	SWITCH,PUSH 1P-1T,R/P SPEED DOWN
S7111	645 006 2797	SWITCH,PUSH 1P-1T,CT.MEMORY
OR	645 008 8049	SWITCH,PUSH 1P-1T,CT.MEMORY
S7112	645 006 2797	SWITCH,PUSH 1P-1T,CT. RESET
OR	645 008 8049	SWITCH,PUSH 1P-1T,CT. RESET
S7113	645 006 2797	SWITCH,PUSH 1P-1T,STILL
OR	645 008 8049	SWITCH,PUSH 1P-1T,STILL
S7114	645 006 2797	SWITCH,PUSH 1P-1T,PLAY
OR	645 008 8049	SWITCH,PUSH 1P-1T,PLAY
S7115	645 006 2797	SWITCH,PUSH 1P-1T,FF
OR	645 008 8049	SWITCH,PUSH 1P-1T,FF
S7116	645 006 2797	SWITCH,PUSH 1P-1T,REW
OR	645 008 8049	SWITCH,PUSH 1P-1T,REW
S7117	645 006 2797	SWITCH,PUSH 1P-1T,STOP
OR	645 008 8049	SWITCH,PUSH 1P-1T,STOP
S7118	645 006 2797	SWITCH,PUSH 1P-1T,REC
OR	645 008 8049	SWITCH,PUSH 1P-1T,REC
S7120	645 006 2797	SWITCH,PUSH 1P-1T,RVS PLAY
OR	645 008 8049	SWITCH,PUSH 1P-1T,RVS PLAY
S7121	645 006 2797	SWITCH,PUSH 1P-1T,TR+
OR	645 008 8049	SWITCH,PUSH 1P-1T,TR+
S7122	645 006 2797	SWITCH,PUSH 1P-1T,TR-
OR	645 008 8049	SWITCH,PUSH 1P-1T,TR-
S7125	613 103 3856	SLIDE SWITCH,ALARM SPD
S7127	613 103 3863	SLIDE SWITCH,ALARM
S7128	645 006 2797	SWITCH,PUSH 1P-1T,ALL CLEAR
OR	645 008 8049	SWITCH,PUSH 1P-1T,ALL CLEAR
S7129	613 103 3856	SLIDE SWITCH,REPEAT
S7131	613 103 3856	SLIDE SWITCH,OSD

(DISPLAYS)

A7101	613 115 9792	FLUORESCENT TUBE
OR	613 117 0629	FLUORESCENT TUBE

LOCATION	PARTS NO.	DESCRIPTION
(MISCELLANEOUS)		
	613 121 6617	HOLDER,DIGITRON
	613 083 5888	HOLDER,LED D5-HCE

****

COMPL PWB,TM-2

COMPL.NO 613 166 4616

(SWITCHES)		
S7219	645 006 2797	SWITCH,PUSH 1P-1T,EJECT
OR	645 008 8049	SWITCH,PUSH 1P-1T,EJECT

****

COMPL PWB,PW-1

COMPL.NO 613 166 4678

(INTEGRATED CIRCUITS)		
IC501	409 297 7509	IC STR-M6549
IC511	409 067 7203	IC L5431
OR	409 180 2307	IC UPC1093J
IC512	409 225 2309	IC PQ12RF11
(DIODES)		
D5001	407 134 8900	DIODE DBC10G
D5003	407 091 6704	DIODE AP01C
D5004	407 078 2705	DIODE 1SS244
D5005	407 100 0402	ZENER DIODE MTZJ36C
D5006	407 100 6909	DIODE AG01
OR	407 091 6902	DIODE ERA38-04
D5011 ⚠	407 151 3308	PHOTO COUPLE PC120FB
D5101	407 169 5707	DIODE RL2Z-LF-C4
OR	407 160 9308	DIODE ERB93-02L3
D5102	407 158 1505	DIODE ERC30-02L38
D5104	407 078 2705	DIODE 1SS244
D5105	407 091 6902	DIODE ERA38-04
D5109	407 063 8507	ZENER DIODE MTZJ4.7C
D5113	407 004 9709	DIODE DSK10C
OR	407 005 8701	DIODE ERA15-02
D5114	407 078 2705	DIODE 1SS244
(INDUCTORS)		
L5001 ⚠	645 003 3858	LINE FILTER
L5002 ⚠	645 002 1886	LINE FILTER
L5003	645 006 3602	INDUCTOR,1.1UH
L5101	645 011 6957	INDUCTOR,10U
L5102	645 011 6957	INDUCTOR,10U
(TRANSFORMER)		
T5001 ⚠	645 000 9730	TRANS,POWER,PULSE
(CAPACITORS)		
C5001 ⚠	404 070 4201	MT-POLYEST 0.068U M 250V
C5002 ⚠	404 070 4201	MT-POLYEST 0.068U M 250V
C5003 ⚠	404 067 4801	CERAMIC 470P K 400V
C5004 ⚠	404 067 4900	CERAMIC 1000P M 400V
C5005 ⚠	404 067 4801	CERAMIC 470P K 400V
C5010	403 249 0204	ELECT 47U M 400V
C5011	403 137 4604	MT-POLYEST 0.047U K 630V
C5012	403 255 8409	CERAMIC 39P J 1K
C5013	403 304 9005	ELECT 10U M 50V
C5101	403 301 2405	ELECT 1000U M 16V
C5102	403 304 9203	ELECT 220U M 16V
C5104	403 301 2405	ELECT 1000U M 16V
C5105	403 304 9203	ELECT 220U M 16V
C5107	403 301 1309	ELECT 47U M 35V
C5108	403 301 1507	ELECT 220U M 6.3V
C5110	403 184 9300	MT-POLYEST 0.047U J 50V

LOCATION	PARTS NO.	DESCRIPTION
C5111	403 121 9509	CERAMIC 0.1U Z 50V
C5112	403 125 5606	ELECT 100U M 16V
C5117	403 001 1906	CERAMIC 0.01U M 16V
C5118	403 001 1906	CERAMIC 0.01U M 16V
(RESISTORS)		
R5001	402 013 9108	SOLID 2.7M KB 1/2W
R5010	401 057 5107	OXIDE-MT 0.47 JA 1W
R5012	401 069 4402	OXIDE-MT 68K JA 2W
R5013	401 016 5704	CARBON 220K JA 1/4W
R5014	401 016 5704	CARBON 220K JA 1/4W
R5015	401 016 5704	CARBON 220K JA 1/4W
R5016	401 016 5704	CARBON 220K JA 1/4W
R5017	401 016 5704	CARBON 220K JA 1/4W
R5018	401 016 5704	CARBON 220K JA 1/4W
R5019	401 012 3308	CARBON 10 JA 1/4W
R5105	401 107 5200	MT-FILM 560 FD 1/4W
R5106	401 107 5309	MT-FILM 620 FD 1/4W
R5107	401 019 7200	CARBON 430 JA 1/4W
R5108	401 012 5609	CARBON 1K JA 1/4W
R5109	401 012 6903	CARBON 10K JA 1/4W
R5112	401 013 6308	CARBON 12K JA 1/4W
R5115	401 042 0308	MT-FILM 120 FD 1/4W
(FUSE)		
F5001 ⚠	423 021 8402	FUSE 250V 2.5A
(PROTECTOR)		
PR513 ⚠	645 009 6396	PROTECTOR,IC 1.0A 50V
(CONNECTOR)		
CN511	645 006 0991	PLUG,12P
(MISCELLANEOUS)		
	645 008 7677	HOLDER,FUSE,F5001
OR	645 008 7660	HOLDER,FUSE,F5001
VA501	408 023 9701	VARISTER ENC471D-05AS6

****

COMPL PWB,PW-2

COMPL.NO 613 166 4685

(CONNECTOR)		
CN521 ⚠	645 008 7691	SOCKET,INLET AC

****

COMPL PWB,TB-1

COMPL.NO 613 166 4555

(INTEGRATED CIRCUIT)		
IC851	409 018 4909	IC LA6458S
(INDUCTORS)		
L8501	613 130 3539	FERRITE CORE
OR	645 008 7936	CORE
L8502	613 130 3539	FERRITE CORE
OR	645 008 7936	CORE
(CAPACITORS)		
C8501	403 189 2405	ELECT 10U M 16V
C8502	403 163 7907	ELECT 47U M 6.3V
C8503	403 189 2405	ELECT 10U M 16V
C8505	403 121 9509	CERAMIC 0.1U Z 50V
C8506	403 119 6701	CERAMIC 0.068U K 16V
C8507	403 121 9509	CERAMIC 0.1U Z 50V
C8508	403 069 1207	CERAMIC 1000P K 50V

LOCATION	PARTS NO.	DESCRIPTION		
C8510	403 121 9509	CERAMIC	0.1U Z	50V
C8511	403 189 2405	ELECT	10U M	16V
C8514	403 189 2405	ELECT	10U M	16V
C8515	403 069 1207	CERAMIC	1000P K	50V
C8516	403 121 9509	CERAMIC	0.1U Z	50V
C8517	403 121 9509	CERAMIC	0.1U Z	50V
C8518	403 068 9402	CERAMIC	100P K	50V

(RESISTORS)

R8501	401 020 2805	CARBON	47K JA	1/4W
R8503	401 012 6903	CARBON	10K JA	1/4W
R8504	401 012 6903	CARBON	10K JA	1/4W
R8505	401 012 6903	CARBON	10K JA	1/4W
R8506	401 012 8006	CARBON	100K JA	1/4W
R8507	401 019 2908	CARBON	39K JA	1/4W
R8508	401 012 4404	CARBON	100 JA	1/4W
R8509	401 014 4006	CARBON	1.5K JA	1/4W
R8510	401 022 6702	CARBON	75 JA	1/4W
R8514	401 012 6903	CARBON	10K JA	1/4W
R8521	401 012 5609	CARBON	1K JA	1/4W
R8523	401 012 5609	CARBON	1K JA	1/4W
R8524	401 012 5609	CARBON	1K JA	1/4W
R8525	401 012 5609	CARBON	1K JA	1/4W
R8527	401 012 5609	CARBON	1K JA	1/4W

(RELAYS)

RY851	645 009 3753	RELAY
RY852	645 009 3753	RELAY

(FUSES)

F8501	610 237 0942	FILTER,EMI
F8502	613 086 4499	FILTER

(JACKS)

JK851	645 005 0237	SOCKET,BNC 1P
JK852	645 005 0237	SOCKET,BNC 1P
JK853	613 009 1659	SOCKET,AUDIO OUT
JK854	613 009 1659	SOCKET,AUDIO IN
JK855	613 087 2791	JACK,MIC,MIC IN
JK856	613 091 4071	JACK,HEADPHONE,REMOTE IN

(MISCELLANEOUS)

	613 166 6917	DEC BACK
	613 108 4254	HOLDER

****

COMPL PCB,MC-1

COMPL.NO 613 122 9884

(DIODES)

D8001	407 094 1300	PHOTO COUPLE SPI-315-04-C
OR	407 043 0101	PHOTO DIODE ON2170-R
D8002	407 094 1300	PHOTO COUPLE SPI-315-04-C
OR	407 043 0101	PHOTO DIODE ON2170-R

(RESISTORS)

R8001	401 026 0607	CARBON	270 JA	1/6W
OR	401 017 0708	CARBON	270 JA	1/4W
R8002	401 024 6700	CARBON	100 JA	1/6W
OR	401 012 4404	CARBON	100 JA	1/4W

(SWITCH)

S8001	645 008 7813	SWITCH,LEAF 1P-1T

****

LOCATION	PARTS NO.	DESCRIPTION
FLEXIBLE FLAT CABLE		
	645 011 3031	FLEXIBLE FLAT CABLE CN101-CN182

TLS-924P

BLOCK DIAGRAMS,CIRCUIT DIAGRAMS & PRINTED WIRING BOARDS

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VIDEO CIRCUIT 4
SYSTEM CONTROL & SERVO CIRCUIT 7

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EE4Q-/EX 5CN

REFERENCE No.SM541106

NOTES:

1. All resistance values in "OHMS" unless otherwise noted.
   (K=1,000 ; M=1,000,000)
2. All capacitance values in "μF" unless otherwise noted.
   p=pico farad ; μ ,u or U=micro farad
3. All inductance values in "μH" unless otherwise noted.
   μ ,u or U=micro henry ; m=milli henry

PRODUCT SAFETY NOTICE

THE COMPONENTS DESIGNATED BY A SYMBOL (⚠) IN THIS SCHEMATIC DIAGRAM DESIGNATES COMPONENTS WHOSE VALUE ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY.
SHOULD ANY COMPONENT DESIGNATED BY A SYMBOL NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST.
DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.

PAL-B

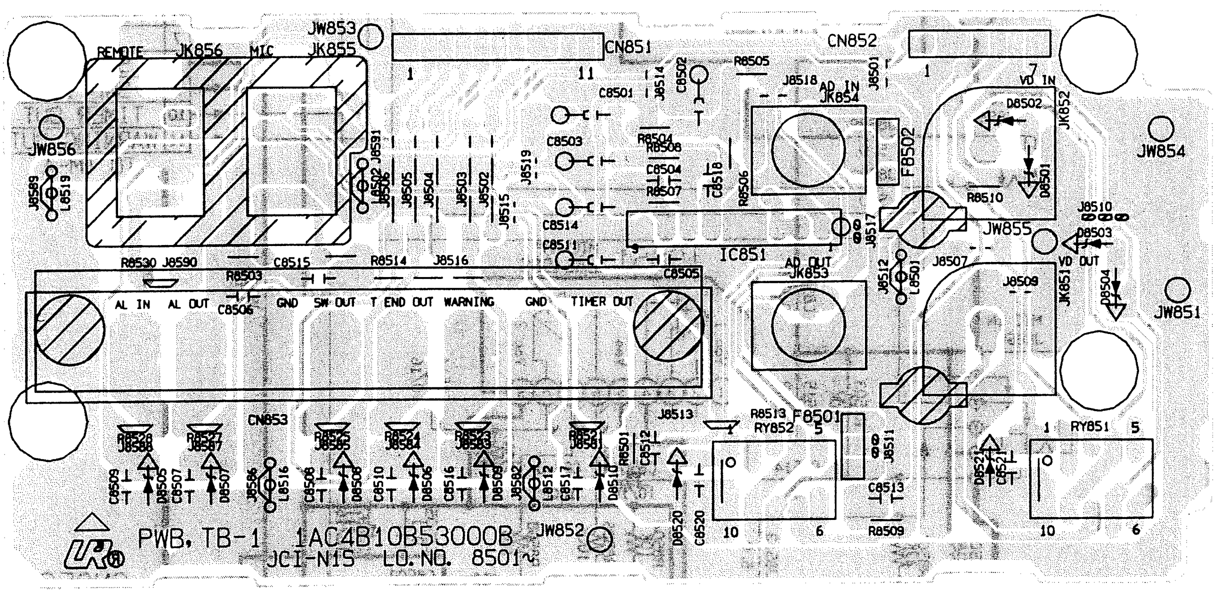
K

J

I

H

TB-1 P.W.B.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REMOTE
JK856
MIC
JK855
CN851
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11
CN852
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7
R8505
J8518
AD IN
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J8501
VD IN
D8502
JK852
C8501
J8514
C8502
C8503
R8504
R8508
C8504
R8507
C8518
R8506
F8502
JW856
J8589
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J8510
D8503
JW855
J8517
C8514
C8511
IC851
R8530
J8590
C8515
R8514
J8516
AD OUT
JK853
C8505
J8512
L8501
J8507
J8509
VD OUT
JK851
D8504
JW851
R8503
C8506
AL IN
AL OUT
GND
SW OUT
T END OUT
WARNING
GND
TIMER OUT
CN853
J8513
R8513
RY852
F8501
5
J8511
1
RY851
5
R8528
J8588
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C8517
D8510
D8520
C8520
C8513
R8509
D8521
C8521
10
6
10
6
PWB, TB-1 1AC4B10B53000B
JCI-N15 LO.NO. 8501~
JW852

G

F

E

D

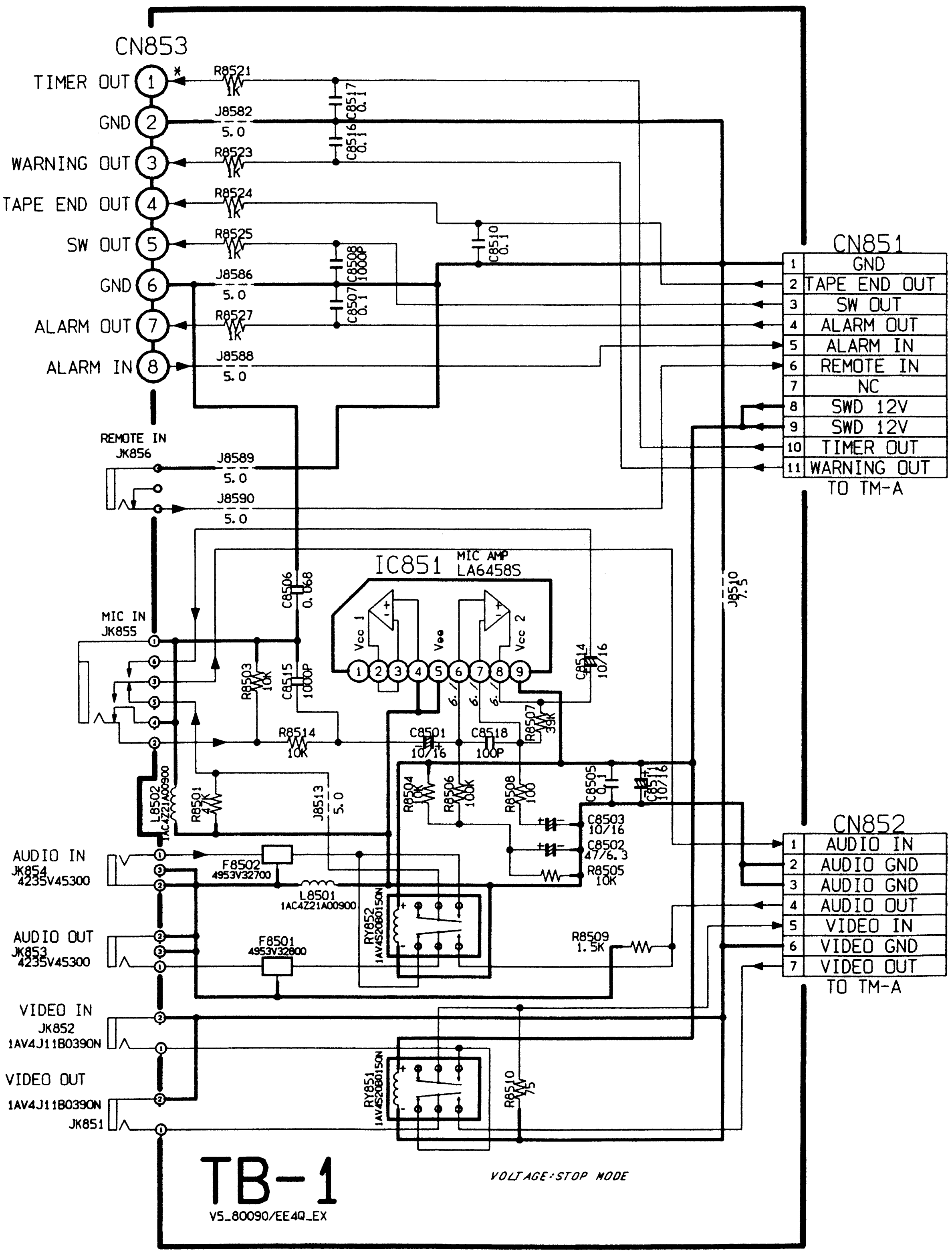
C

B

A

1 2 3 4 5 6 7 8

TB-1 BOARD TERMINAL


CN853
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GND 2
WARNING OUT 3
TAPE END OUT 4
SW OUT 5
GND 6
ALARM OUT 7
ALARM IN 8
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R8523 1K
R8524 1K
R8525 1K
J8586 5.0
R8527 1K
J8588 5.0
C8517 0.1
C8516 0.1
C8508 1000P
C8507 0.1
C8510 0.1
CN851
1 GND
2 TAPE END OUT
3 SW OUT
4 ALARM OUT
5 ALARM IN
6 REMOTE IN
7 NC
8 SWD 12V
9 SWD 12V
10 TIMER OUT
11 WARNING OUT
TO TM-A
REMOTE IN JK856
J8589 5.0
J8590 5.0
IC851 MIC AMP LA6458S
Vcc 1
Vee
Vcc 2
C8506 0.068
C8515 1000P
C8514 10/16
J8510 7.5
MIC IN JK855
R8503 10K
R8514 10K
C8501 10/16
C8518 100P
R8507 39K
R8504 10K
R8506 100K
R8508 100
C8505 0.1
C8511 10/16
C8503 10/16
C8502 47/6.3
R8505 10K
L8502 1AC4Z21A00900
R8501 4.7K
J8513 5.0
AUDIO IN JK854 4235V45300
F8502 4953V32700
L8501 1AC4Z21A00900
RY852 1AV4S2080150N
AUDIO OUT JK853 4235V45300
F8501 4953V32800
R8509 1.5K
CN852
1 AUDIO IN
2 AUDIO GND
3 AUDIO GND
4 AUDIO OUT
5 VIDEO IN
6 VIDEO GND
7 VIDEO OUT
TO TM-A
VIDEO IN JK852 1AV4J11B0390N
VIDEO OUT 1AV4J11B0390N JK851
RY851 1AV4S2080150N
R8510 75
TB-1
V5_80090/EE4Q_EX
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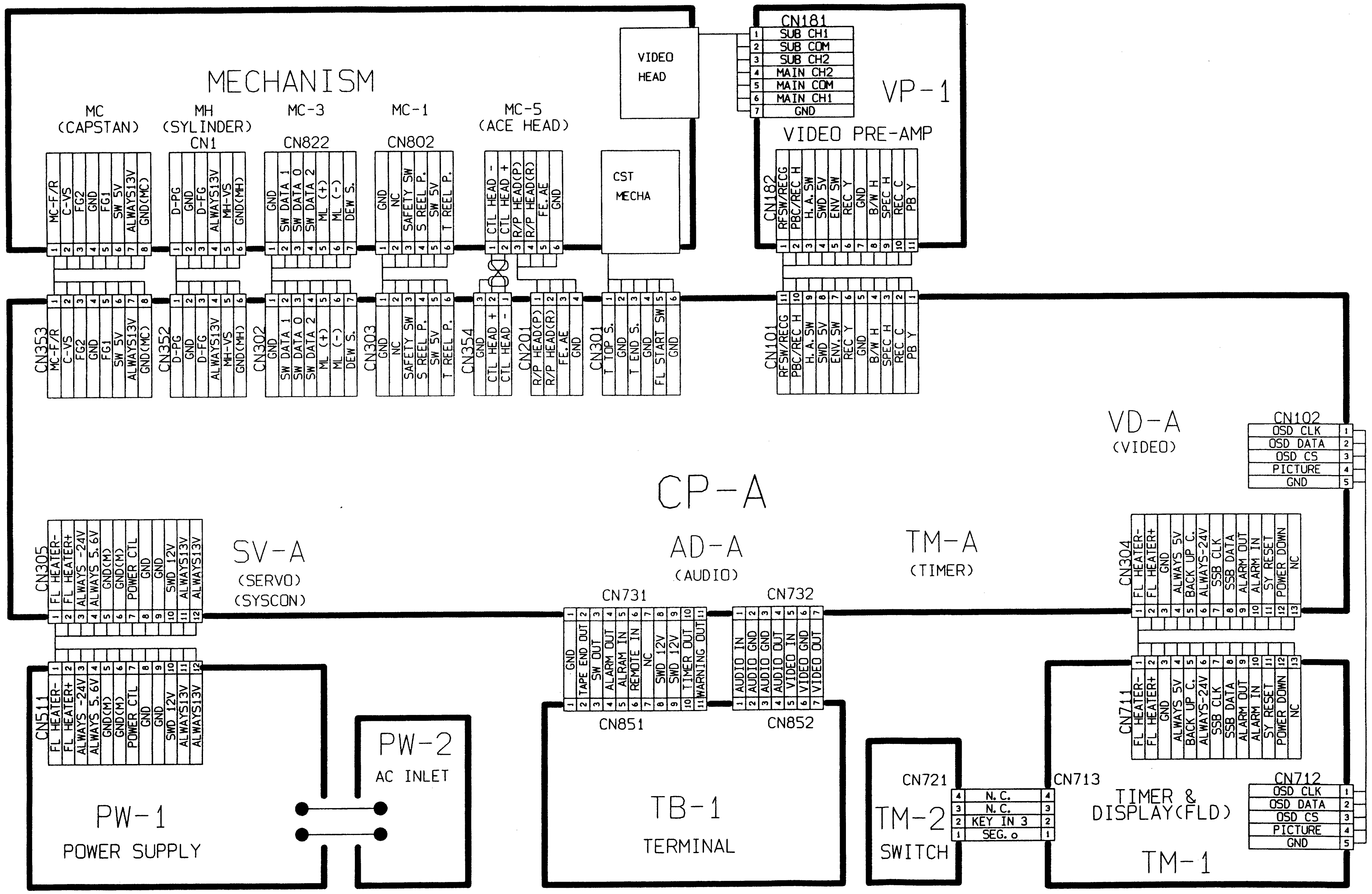
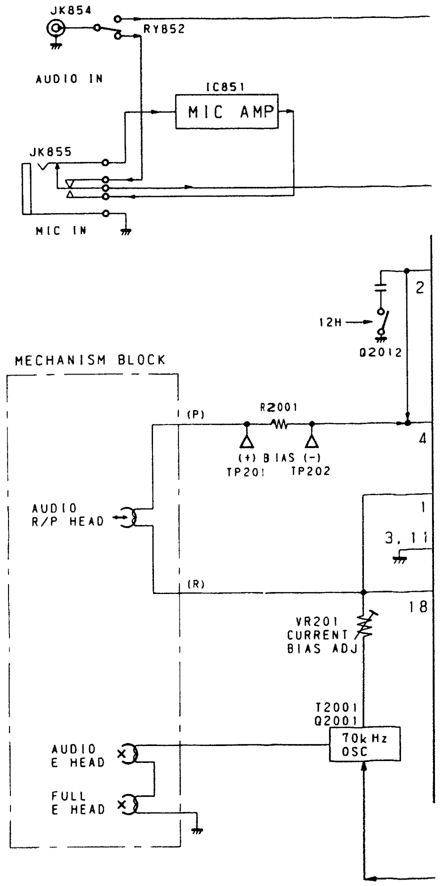
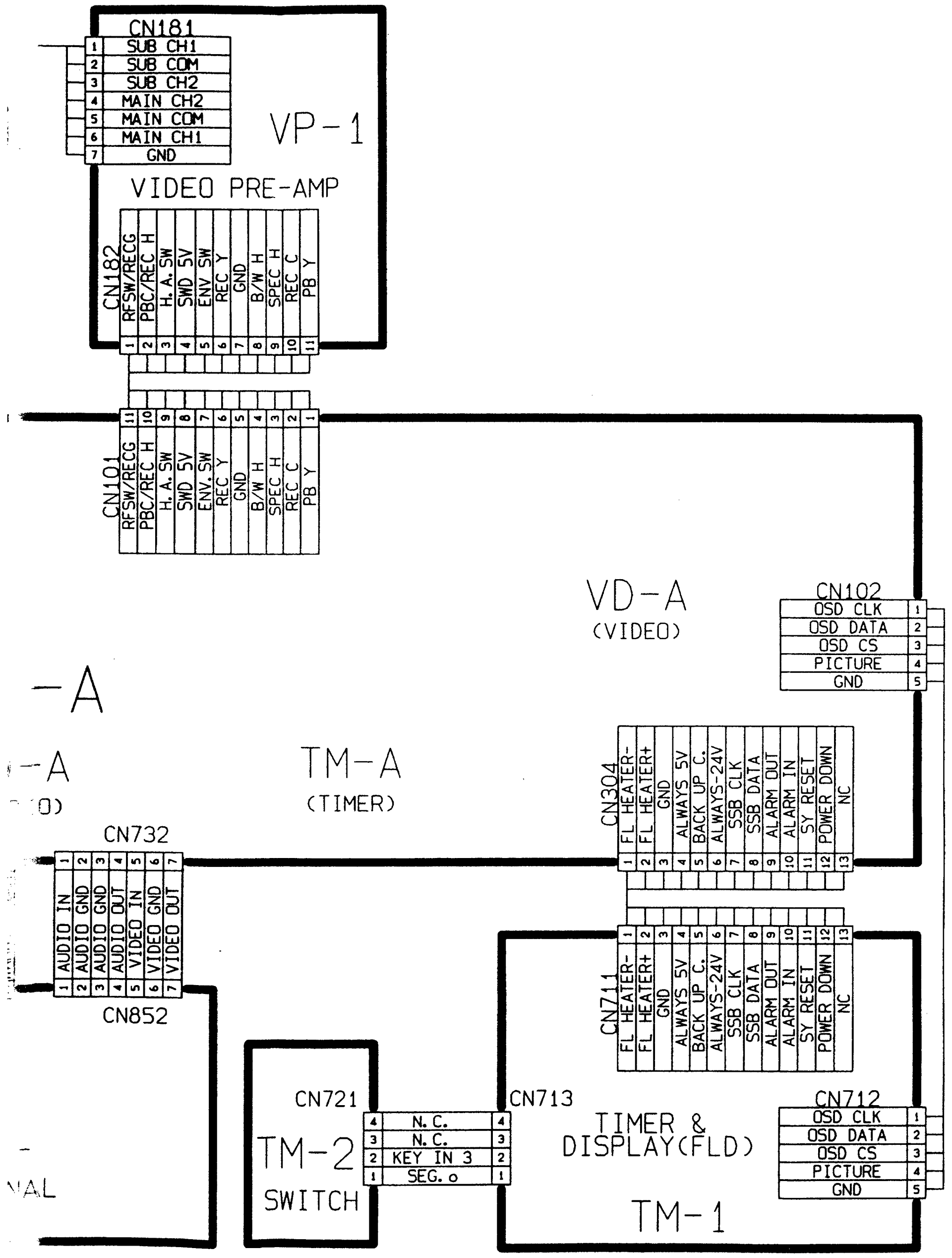
1. OVERALL WIRING & BLOCK DIAGRAMS

OVERALL WIRING


MECHANISM
MC (CAPSTAN)
MH (SYLINDER) CN1
MC-3 CN822
MC-1 CN802
MC-5 (ACE HEAD)
VIDEO HEAD
CST MECHA
MC-F/R, C-VS, FG2, GND, FG1, SW 5V, ALWAYS13V, GND(MC)
D-PG, GND, D-FG, ALWAYS13V, MH-VS, GND(MH)
GND, SW DATA 1, SW DATA 0, SW DATA 2, ML (+), ML (-), DEW S.
GND, NC, SAFETY SW, S REEL P., SW 5V, T REEL P.
CTL HEAD -, CTL HEAD +, R/P HEAD(P), R/P HEAD(R), FE.AE, GND
VP-1 VIDEO PRE-AMP
CN181: 1 SUB CH1, 2 SUB COM, 3 SUB CH2, 4 MAIN CH2, 5 MAIN COM, 6 MAIN CH1, 7 GND
CN182: RFSW/RECG, PBC/REC H, H. A. SW, SWD 5V, ENV SW, REC Y, GND, B/W H, SPEC H, REC C, PB Y
CP-A
CN353: MC-F/R, C-VS, FG2, GND, FG1, SW 5V, ALWAYS13V, GND(MC)
CN352: D-PG, GND, D-FG, ALWAYS13V, MH-VS, GND(MH)
CN302: GND, SW DATA 1, SW DATA 0, SW DATA 2, ML (+), ML (-), DEW S.
CN303: GND, NC, SAFETY SW, S REEL P., SW 5V, T REEL P.
CN354: GND, CTL HEAD +, CTL HEAD -
CN201: R/P HEAD(P), R/P HEAD(R), FE.AE, GND
CN301: T TOP S., GND, T END S., GND, FL START SW, GND
CN101: RFSW/RECG, PBC/REC H, H. A. SW, SWD 5V, ENV. SW, REC Y, GND, B/W H, SPEC H, REC C, PB Y
VD-A (VIDEO)
CN102: 1 OSD CLK, 2 OSD DATA, 3 OSD CS, 4 PICTURE, 5 GND
SV-A (SERVO) (SYSCON)
AD-A (AUDIO)
TM-A (TIMER)
CN305: FL HEATER-, FL HEATER+, ALWAYS -24V, ALWAYS 5.6V, GND(M), GND(M), POWER CTL, GND, GND, SWD 12V, ALWAYS13V, ALWAYS13V
CN304: FL HEATER-, FL HEATER+, GND, ALWAYS 5V, BACK UP C., ALWAYS-24V, SSB CLK, SSB DATA, ALARM OUT, ALARM IN, SY RESET, POWER DOWN, NC
CN731: GND, TAPE END OUT, SW OUT, ALARM OUT, REMOTE IN, NC, SWD 12V, SWD 12V, TIMER OUT, WARNING OUT
CN732: AUDIO IN, AUDIO GND, AUDIO GND, AUDIO OUT, VIDEO IN, VIDEO GND, VIDEO OUT
CN851
CN852
CN511: FL HEATER-, FL HEATER+, ALWAYS -24V, ALWAYS 5.6V, GND(M), GND(M), POWER CTL, GND, GND, SWD 12V, ALWAYS13V, ALWAYS13V
PW-1 POWER SUPPLY
PW-2 AC INLET
TB-1 TERMINAL
CN721
TM-2 SWITCH
4 N.C., 3 N.C., 2 KEY IN 3, 1 SEG. o
CN713
CN711: FL HEATER-, FL HEATER+, GND, ALWAYS 5V, BACK UP C., ALWAYS-24V, SSB CLK, SSB DATA, ALARM OUT, ALARM IN, SY RESET, POWER DOWN, NC
CN712: 1 OSD CLK, 2 OSD DATA, 3 OSD CS, 4 PICTURE, 5 GND
TIMER & DISPLAY(FLD) TM-1

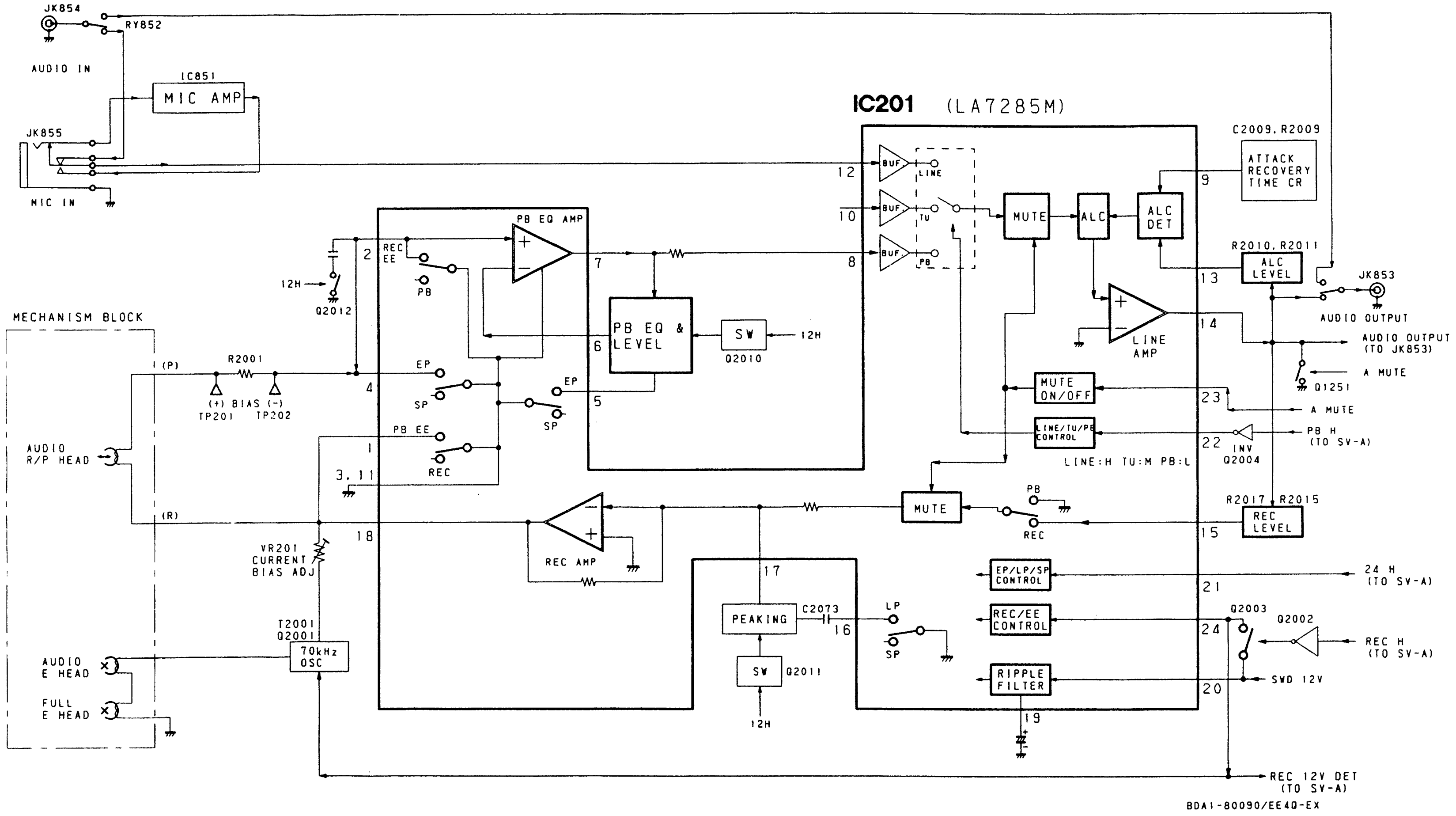

JK854
RY852
AUDIO IN
IC851
MIC AMP
JK855
MIC IN
12H
Q2012
MECHANISM BLOCK
(P)
R2001
(+) BIAS (-)
TP201 TP202
AUDIO R/P HEAD
(R)
VR201 CURRENT BIAS ADJ
T2001 Q2001
70kHz OSC
AUDIO E HEAD
FULL E HEAD
2
4
1
3. 11
18

IRING



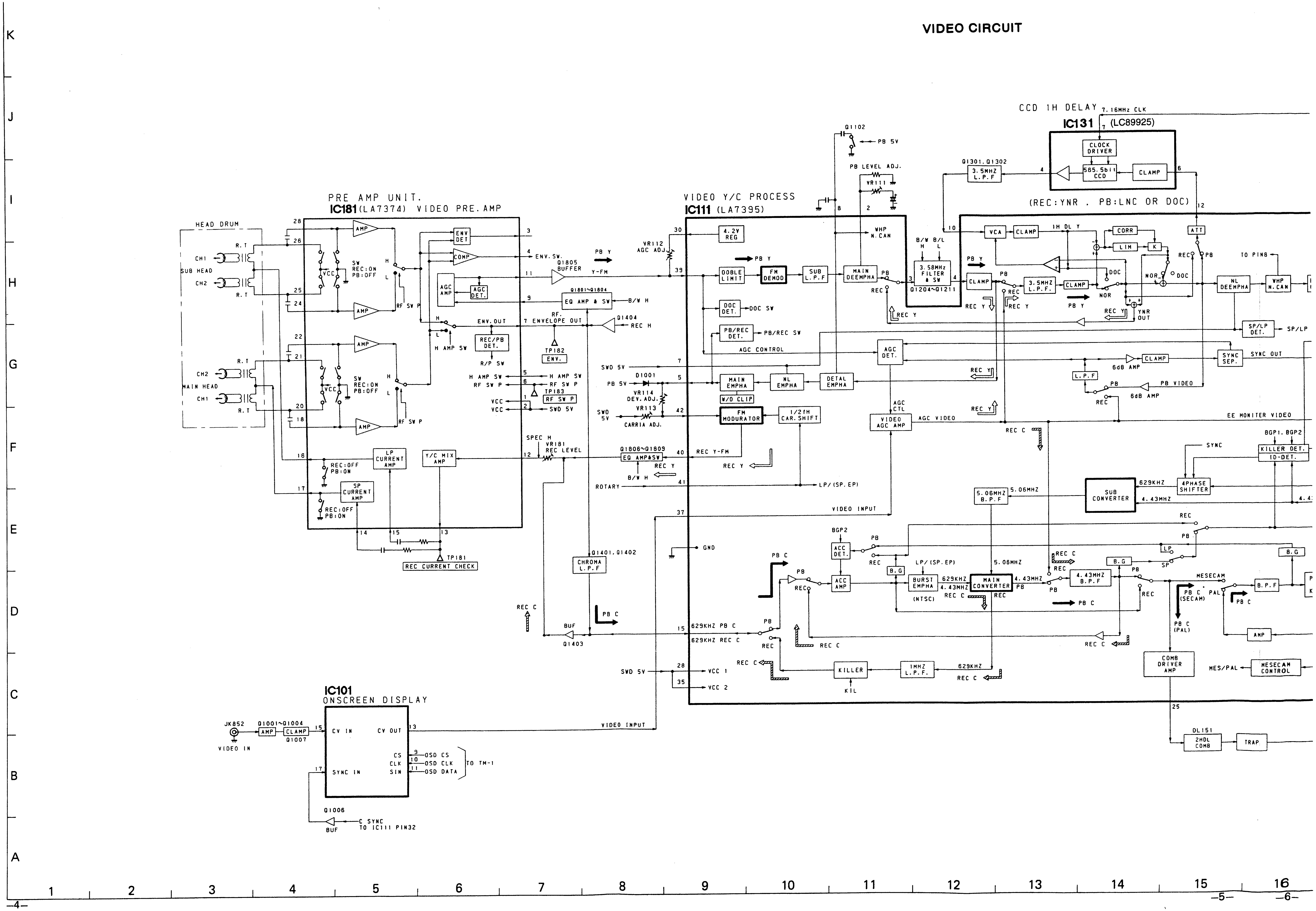
CN181
1 SUB CH1
2 SUB COM
3 SUB CH2
4 MAIN CH2
5 MAIN COM
6 MAIN CH1
7 GND
VP-1
VIDEO PRE-AMP
CN182
RFSW/RECG
PBC/REC H
H.A.SW
SWD 5V
ENV.SW
REC Y
GND
B/W H
SPEC H
REC C
PB Y
CN101
RFSW/RECG
PBC/REC H
H.A.SW
SWD 5V
ENV.SW
REC Y
GND
B/W H
SPEC H
REC C
PB Y
VD-A
(VIDEO)
CN102
OSD CLK
OSD DATA
OSD CS
PICTURE
GND
-A
-A
:O)
TM-A
(TIMER)
CN732
AUDIO IN
AUDIO GND
AUDIO GND
AUDIO OUT
VIDEO IN
VIDEO GND
VIDEO OUT
CN852
CN304
FL HEATER-
FL HEATER+
GND
ALWAYS 5V
BACK UP C.
ALWAYS-24V
SSB CLK
SSB DATA
ALARM OUT
ALARM IN
SY RESET
POWER DOWN
NC
CN711
FL HEATER-
FL HEATER+
GND
ALWAYS 5V
BACK UP C.
ALWAYS-24V
SSB CLK
SSB DATA
ALARM OUT
ALARM IN
SY RESET
POWER DOWN
NC
CN721
TM-2
SWITCH
N.C.
N.C.
KEY IN 3
SEG. o
CN713
TIMER &
DISPLAY(FLD)
TM-1
CN712
OSD CLK
OSD DATA
OSD CS
PICTURE
GND
NAL

AUDIO CIRCUIT



JK854
RY852
AUDIO IN
IC851
MIC AMP
JK855
MIC IN
IC201 (LA7285M)
BUF
LINE
TU
PB
MUTE
ALC
ALC DET
C2009, R2009
ATTACK RECOVERY TIME CR
12
10
8
9
R2010, R2011
ALC LEVEL
JK853
13
LINE AMP
14
AUDIO OUTPUT
AUDIO OUTPUT (TO JK853)
A MUTE
Q1251
MUTE ON/OFF
23
LINE/TU/PB CONTROL
22
INV
Q2004
PB H (TO SV-A)
LINE:H TU:M PB:L
R2017, R2015
REC LEVEL
15
PB
REC
MUTE
PB EQ AMP
REC
EE
PB
2
12H
Q2012
7
PB EQ & LEVEL
6
SW
Q2010
12H
MECHANISM BLOCK
(P)
R2001
(+) BIAS (-)
TP201 TP202
4
EP
SP
EP
SP
5
PB EE
REC
1
3, 11
AUDIO R/P HEAD
(R)
18
REC AMP
VR201 CURRENT BIAS ADJ
T2001
Q2001
70kHz OSC
AUDIO E HEAD
FULL E HEAD
17
PEAKING
C2073
16
LP
SP
SW
Q2011
12H
EP/LP/SP CONTROL
21
24 H (TO SV-A)
REC/EE CONTROL
24
Q2003
Q2002
REC H (TO SV-A)
RIPPLE FILTER
20
SWD 12V
19
REC 12V DET (TO SV-A)
BDA1-80090/EE40-EX

VIDEO CIRCUIT



PRE AMP UNIT.
IC181 (LA7374) VIDEO PRE.AMP
HEAD DRUM
SUB HEAD
MAIN HEAD
CH1
CH2
R.T
AMP
SW REC:ON PB:OFF
ENV DET
COMP
AGC AMP
AGC DET.
REC/PB DET.
R/P SW
H AMP SW
RF SW P
ENV.OUT
ENV.SW.
LP CURRENT AMP
SP CURRENT AMP
Y/C MIX AMP
REC:OFF PB:ON
TP181
REC CURRENT CHECK
TP182
ENV.
TP183
RF SW P
Q1805 BUFFER
Y-FM
Q1801~Q1804
EQ AMP & SW
B/W H
RF. ENVELOPE OUT
Q1404
REC H
VCC
SWD 5V
SPEC H
VR181 REC LEVEL
Q1806~Q1809
EQ AMP&SW
REC Y
ROTARY
Q1401.Q1402
CHROMA L.P.F
BUF
Q1403
REC C
PB C
PB Y
VR112 AGC ADJ.
VIDEO Y/C PROCESS
IC111 (LA7395)
4.2V REG
DOBLE LIMIT
FM DEMOD
SUB L.P.F
MAIN DEEMPHA
WHP N.CAN
DOC DET.
DOC SW
PB/REC DET.
PB/REC SW
AGC CONTROL
AGC DET.
MAIN EMPHA
W/D CLIP
NL EMPHA
DETAL EMPHA
D1001
PB 5V
VR114 DEV.ADJ.
VR113
CARRIA ADJ.
FM MODURATOR
1/2fH CAR.SHIFT
REC Y-FM
LP/(SP.EP)
VIDEO INPUT
AGC CTL
VIDEO AGC AMP
AGC VIDEO
GND
Q1102
PB 5V
PB LEVEL ADJ.
VR111
CCD 1H DELAY
IC131 (LC89925)
7.16MHz CLK
CLOCK DRIVER
565.5bit CCD
CLAMP
Q1301.Q1302
3.5MHZ L.P.F
(REC:YNR . PB:LNC OR DOC)
B/W B/L H L
3.58MHz FILTER & SW
Q1204~Q1211
VCA
1H DL Y
CORR
LIN
K
ATT
DOC
NOR
YNR OUT
3.5MHZ L.P.F.
NL DEEMPHA
WHP N.CAN
TO PIN8
SP/LP DET.
SP/LP
SYNC SEP.
SYNC OUT
6dB AMP
L.P.F
PB VIDEO
EE MONITER VIDEO
BGP1.BGP2
KILLER DET.
ID-DET.
SYNC
4PHASE SHIFTER
SUB CONVERTER
629KHZ
4.43MHZ
5.06MHZ
5.06MHZ B.P.F
BGP2
ACC DET.
ACC AMP
B.G
BURST EMPHA
(NTSC)
MAIN CONVERTER
4.43MHZ B.P.F
MESECAM
PB C (SECAM)
PB C (PAL)
PAL
B.P.F
AMP
COMB DRIVER AMP
MES/PAL
MESECAM CONTROL
629KHZ PB C
629KHZ REC C
KILLER
KIL
1MHZ L.P.F.
VCC 1
VCC 2
DL151
2HDL COMB
TRAP
IC101
ONSCREEN DISPLAY
JK852
VIDEO IN
Q1001~Q1004
CLAMP
Q1007
CV IN
CV OUT
SYNC IN
CS
CLK
SIN
OSD CS
OSD CLK
OSD DATA
TO TM-1
Q1006
C SYNC TO IC111 PIN32
K
J
I
H
G
F
E
D
C
B
A
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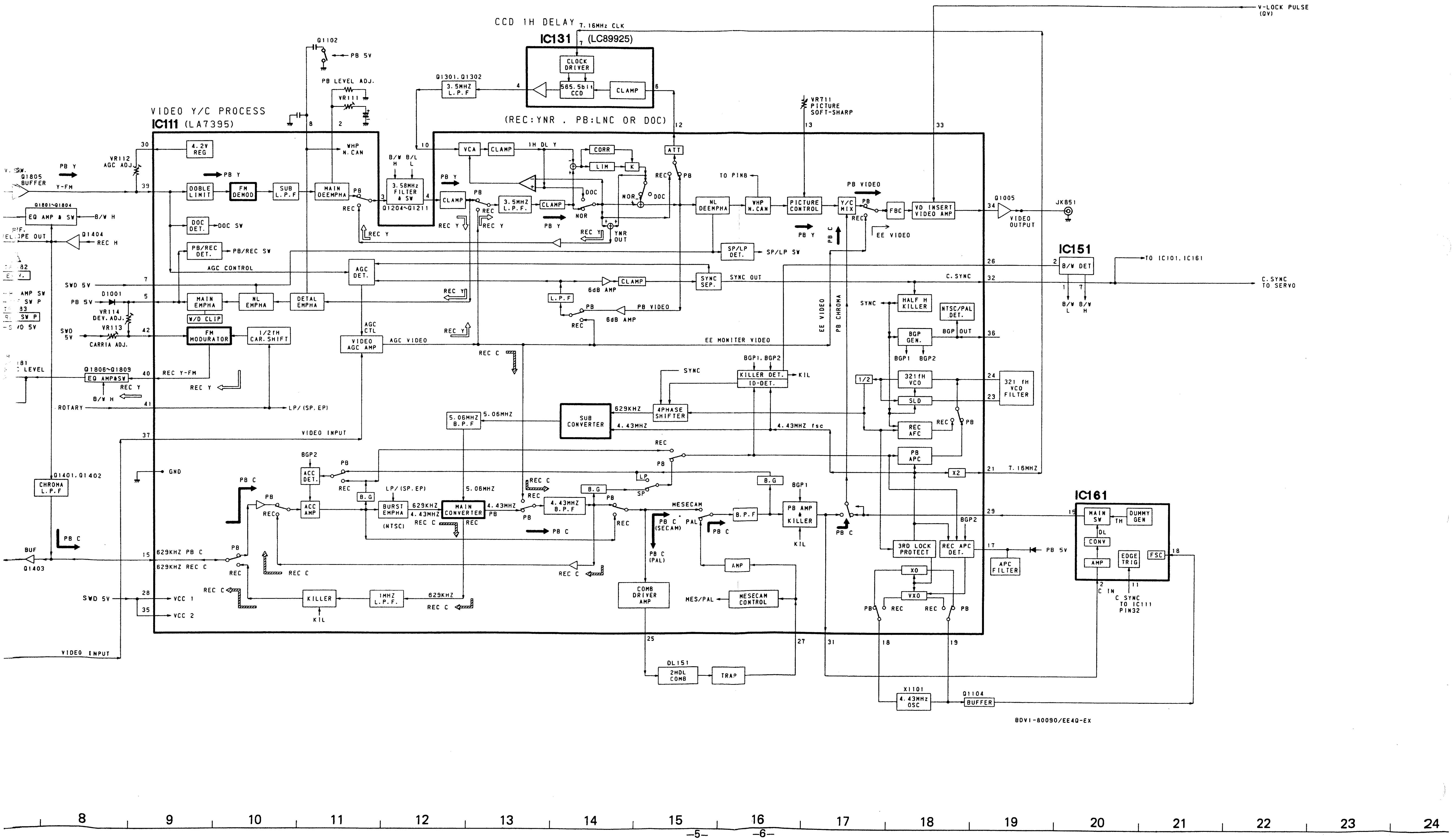
VIDEO CIRCUIT


CCD 1H DELAY
IC131 (LC89925)
7.16MHz CLK
CLOCK DRIVER
565.5bit CCD
CLAMP
(REC:YNR . PB:LNC OR DOC)
Q1301.Q1302
3.5MHZ L.P.F
Q1102
PB 5V
PB LEVEL ADJ.
VR111
VIDEO Y/C PROCESS
IC111 (LA7395)
4.2V REG
VR112 AGC ADJ.
Q1805 BUFFER
Y-FM
PB Y
DOBLE LIMIT
FM DEMOD
SUB L.P.F
MAIN DEEMPHA
WHP N.CAN
B/W B/L H L
3.58MHz FILTER & SW
Q1204~Q1211
CLAMP
VCA
1H DL Y
CORR
LIM
K
3.5MHZ L.P.F.
NOR
DOC
YNR OUT
ATT
TO PIN8
NL DEEMPHA
WHP N.CAN
VR711 PICTURE SOFT-SHARP
PICTURE CONTROL
Y/C MIX
PB VIDEO
EE VIDEO
FBC
VD INSERT VIDEO AMP
Q1005
JK851
VIDEO OUTPUT
V-LOCK PULSE (QV)
DOC DET.
DOC SW
PB/REC DET.
PB/REC SW
AGC CONTROL
AGC DET.
SP/LP DET.
SP/LP SW
SYNC SEP.
SYNC OUT
C.SYNC
IC151
B/W DET
TO IC101, IC161
C.SYNC TO SERVO
B/W L
B/W H
EQ AMP & SW
Q1801~Q1804
Q1404
REC H
SWD 5V
D1001
PB 5V
MAIN EMPHA
NL EMPHA
DETAL EMPHA
W/O CLIP
VR114 DEV.ADJ.
VR113 CARRIA ADJ.
FM MODURATOR
1/2fH CAR.SHIFT
AGC CTL
VIDEO AGC AMP
AGC VIDEO
EE MONITER VIDEO
6dB AMP
L.P.F
HALF H KILLER
NTSC/PAL DET.
BGP GEN.
BGP OUT
BGP1 BGP2
KILLER DET.
ID-DET.
KIL
SYNC
4PHASE SHIFTER
629KHZ
SUB CONVERTER
4.43MHZ
5.06MHZ B.P.F
5.06MHZ
321fH VCO
321 fH VCO FILTER
SLD
1/2
REC AFC
PB APC
X2
7.16MHZ
Q1806~Q1809
EQ AMP&SW
REC Y-FM
ROTARY
LP/(SP.EP)
VIDEO INPUT
GND
Q1401.Q1402
CHROMA L.P.F
BUF
Q1403
629KHZ PB C
629KHZ REC C
ACC DET.
BGP2
ACC AMP
B.G
BURST EMPHA
(NTSC)
MAIN CONVERTER
4.43MHZ B.P.F
MESECAM
PB C (SECAM)
PB C (PAL)
B.P.F
PB AMP & KILLER
3RD LOCK PROTECT
REC APC DET.
XO
VXO
APC FILTER
IC161
MAIN SW
DUMMY GEN
CONV
AMP
EDGE TRIG
FSC
C IN
C SYNC TO IC111 PIN32
KILLER
1MHZ L.P.F.
COMB DRIVER AMP
AMP
MESECAM CONTROL
MES/PAL
VCC 1
VCC 2
DL151
2HDL COMB
TRAP
X1101
4.43MHz OSC
Q1104
BUFFER
BDV1-80090/EE4Q-EX
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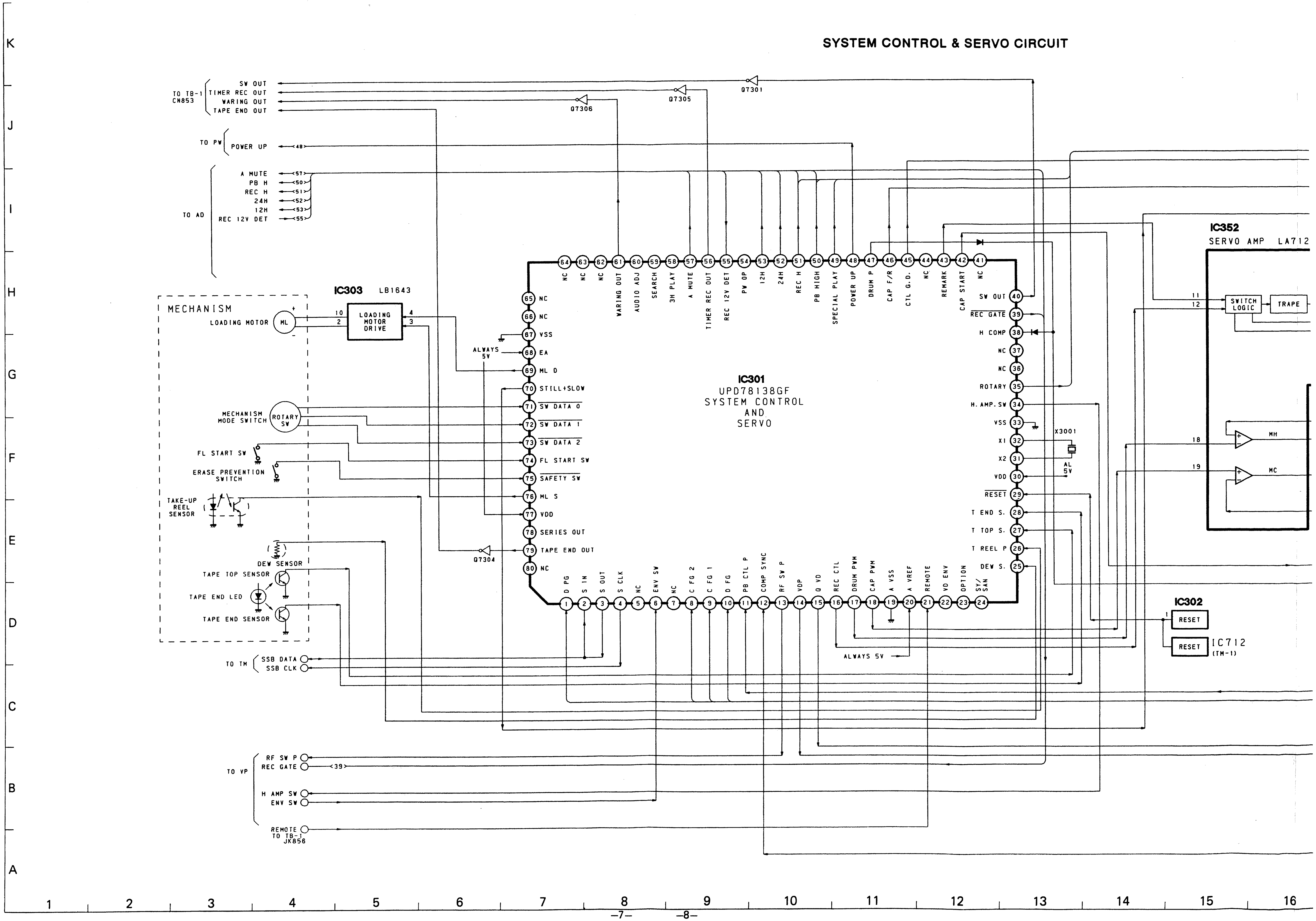
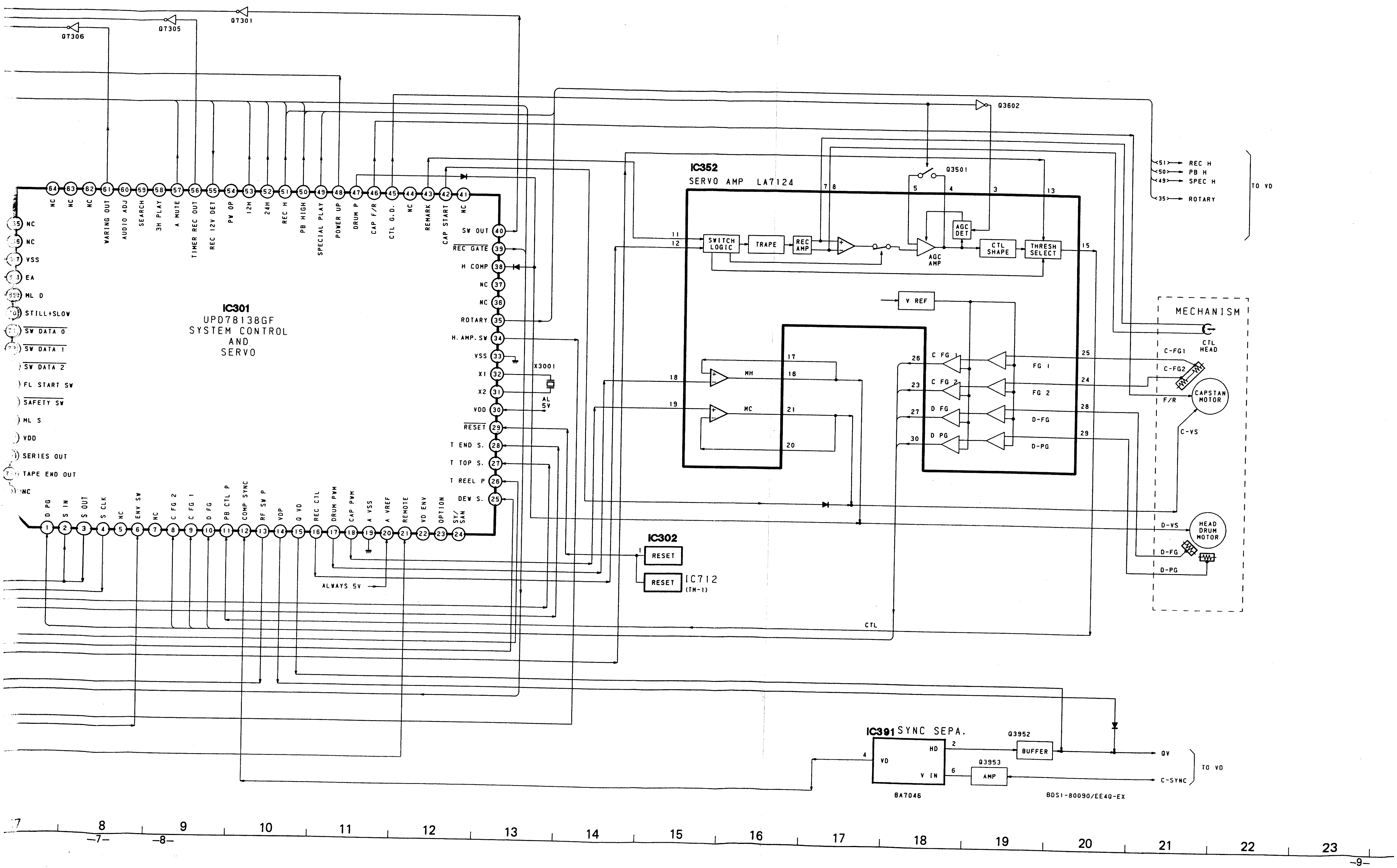
SYSTEM CONTROL & SERVO CIRCUIT


IC301
UPD78138GF
SYSTEM CONTROL
AND
SERVO
IC303 LB1643
LOADING MOTOR DRIVE
IC352
SERVO AMP LA712
SWITCH LOGIC
TRAPE
MH
MC
IC302
RESET
RESET
IC712 (TM-1)
X3001
AL 5V
ALWAYS 5V
Q7301
Q7305
Q7306
Q7304
TO TB-1 CN853
SW OUT
TIMER REC OUT
WARING OUT
TAPE END OUT
TO PW
POWER UP
TO AD
A MUTE
PB H
REC H
24H
12H
REC 12V DET
MECHANISM
LOADING MOTOR
ML
MECHANISM MODE SWITCH
ROTARY SW
FL START SW
ERASE PREVENTION SWITCH
TAKE-UP REEL SENSOR
DEW SENSOR
TAPE TOP SENSOR
TAPE END LED
TAPE END SENSOR
TO TM
SSB DATA
SSB CLK
TO VP
RF SW P
REC GATE
H AMP SW
ENV SW
REMOTE
TO TB-1 JK856
1 D PG
2 S IN
3 S OUT
4 S CLK
5 NC
6 ENV SW
7 NC
8 C FG 2
9 C FG 1
10 D FG
11 PB CTL P
12 COMP SYNC
13 RF SW P
14 VDP
15 Q VD
16 REC CTL
17 DRUM PWM
18 CAP PWM
19 A VSS
20 A VREF
21 REMOTE
22 VD ENV
23 OPTION
24 SY/SAN
25 DEW S.
26 T REEL P
27 T TOP S.
28 T END S.
29 RESET
30 VDD
31 X2
32 X1
33 VSS
34 H. AMP. SW
35 ROTARY
36 NC
37 NC
38 H COMP
39 REC GATE
40 SW OUT
41 NC
42 CAP START
43 REMARK
44 NC
45 CTL G.D.
46 CAP F/R
47 DRUM P
48 POWER UP
49 SPECIAL PLAY
50 PB HIGH
51 REC H
52 24H
53 12H
54 PW OP
55 REC 12V DET
56 TIMER REC OUT
57 A MUTE
58 3H PLAY
59 SEARCH
60 AUDIO ADJ
61 WARING OUT
62 NC
63 NC
64 NC
65 NC
66 NC
67 VSS
68 EA
69 ML D
70 STILL+SLOW
71 SW DATA 0
72 SW DATA 1
73 SW DATA 2
74 FL START SW
75 SAFETY SW
76 ML S
77 VDD
78 SERIES OUT
79 TAPE END OUT
80 NC
<57> <50> <51> <52> <53> <55> <48> <39>
10 2 4 3
11 12 18 19 1
K J I H G F E D C B A
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

SYSTEM CONTROL & SERVO CIRCUIT


Q7306
Q7305
Q7301
Q3602
IC301
UPD78138GF
SYSTEM CONTROL
AND
SERVO
NC
NC
NC
WARING OUT
AUDIO ADJ
SEARCH
3H PLAY
A MUTE
TIMER REC OUT
REC 12V DET
PW OP
12H
24H
REC H
PB HIGH
SPECIAL PLAY
POWER UP
DRUM P
CAP F/R
CTL G.D.
NC
REMARK
CAP START
NC
SW OUT
REC GATE
H COMP
NC
NC
ROTARY
H. AMP. SW
VSS
X1
X2
VDD
RESET
T END S.
T TOP S.
T REEL P
DEW S.
X3001
AL 5V
NC
NC
VSS
EA
ML D
STILL+SLOW
SW DATA 0
SW DATA 1
SW DATA 2
FL START SW
SAFETY SW
ML S
VDD
SERIES OUT
TAPE END OUT
NC
D PG
S IN
S OUT
S CLK
NC
ENV SW
NC
C FG 2
C FG 1
D FG
PB CTL P
COMP SYNC
RF SW P
VDP
Q VD
REC CTL
DRUM PWM
CAP PWM
A VSS
A VREF
REMOTE
VD ENV
OPTION
SY/SAN
ALWAYS 5V
IC302
RESET
RESET
IC712
(TM-1)
IC352
SERVO AMP LA7124
Q3501
SWITCH LOGIC
TRAPE
REC AMP
AGC AMP
AGC DET
CTL SHAPE
THRESH SELECT
V REF
MH
MC
C FG 1
C FG 2
D FG
D PG
FG 1
FG 2
D-FG
D-PG
<51> REC H
<50> PB H
<49> SPEC H
<35> ROTARY
TO VD
MECHANISM
CTL HEAD
C-FG1
C-FG2
F/R
CAPSTAN MOTOR
C-VS
D-VS
HEAD DRUM MOTOR
D-FG
D-PG
CTL
IC391 SYNC SEPA.
VD
HD
V IN
BA7046
Q3952
BUFFER
Q3953
AMP
QV
C-SYNC
TO VD
BDS1-80090/EE4Q-EX
7
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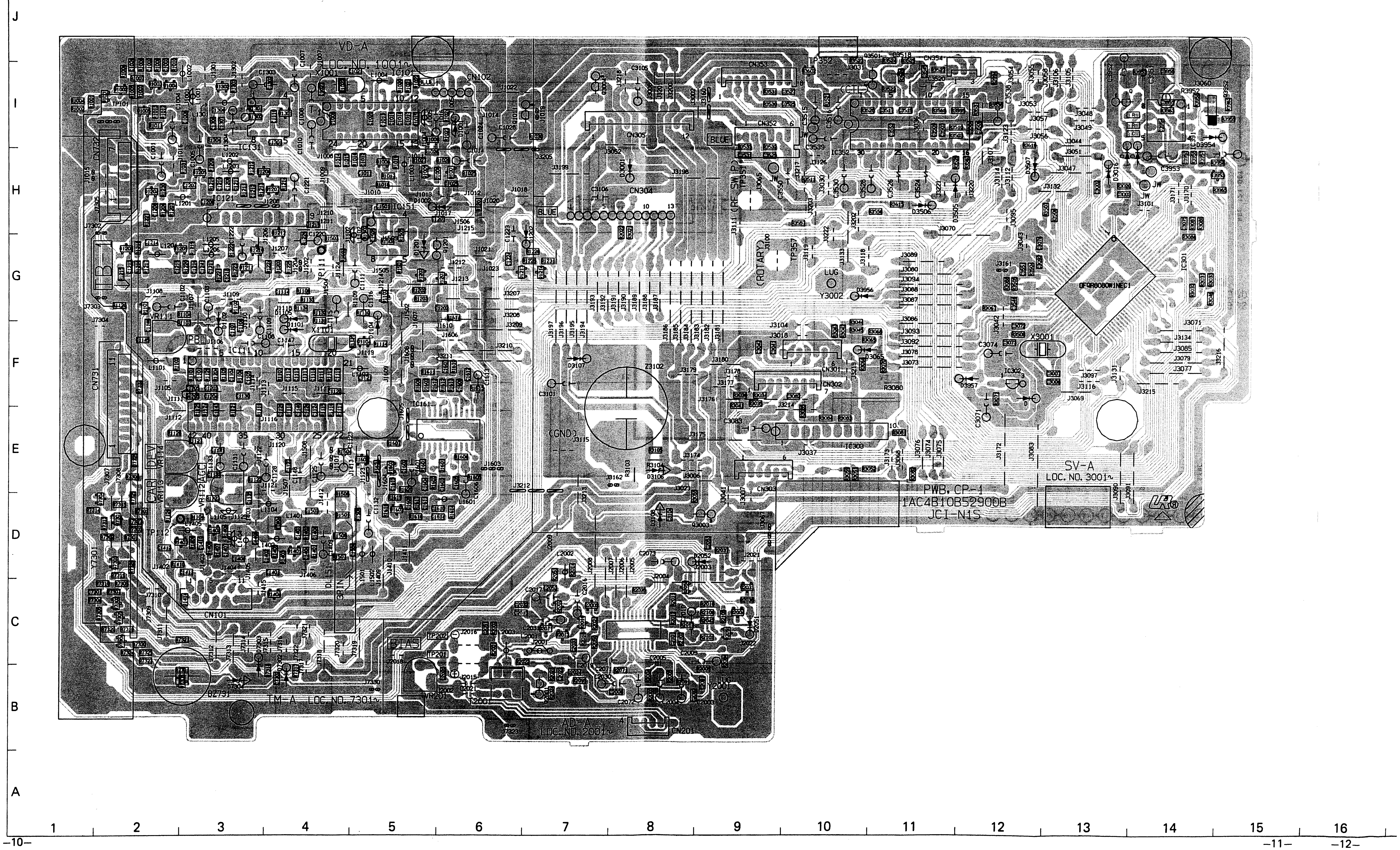
2. CIRCUIT DIAGRAMS & PRINTED WIRING BOARDS (P.W.B.)

CP-1 P.W.B.


VD-A
LOC. NO. 1001~
SV-A
LOC. NO. 3001~
AD-A
LOC. NO. 2001~
TM-A LOC. NO. 7301~
PWB. CP-1
1AC4B10B52900B
JCI-N1S
CN101
CN102
CN201
CN301
CN302
CN303
CN304
CN305
CN352
CN353
CN354
CN721
CN731
IC101
IC111
IC121
IC131
IC151
IC161
IC301
IC302
IC303
IC350
BLUE
BIAS
(GND)
(ROTARY)
CAR
DEV
LUG
X1001
X1101
X3001
Y3002
Z3102
VR111
VR201
TP101
TP201
TP202
TP351
TP352
TP357
K
J
I
H
G
F
E
D
C
B
A
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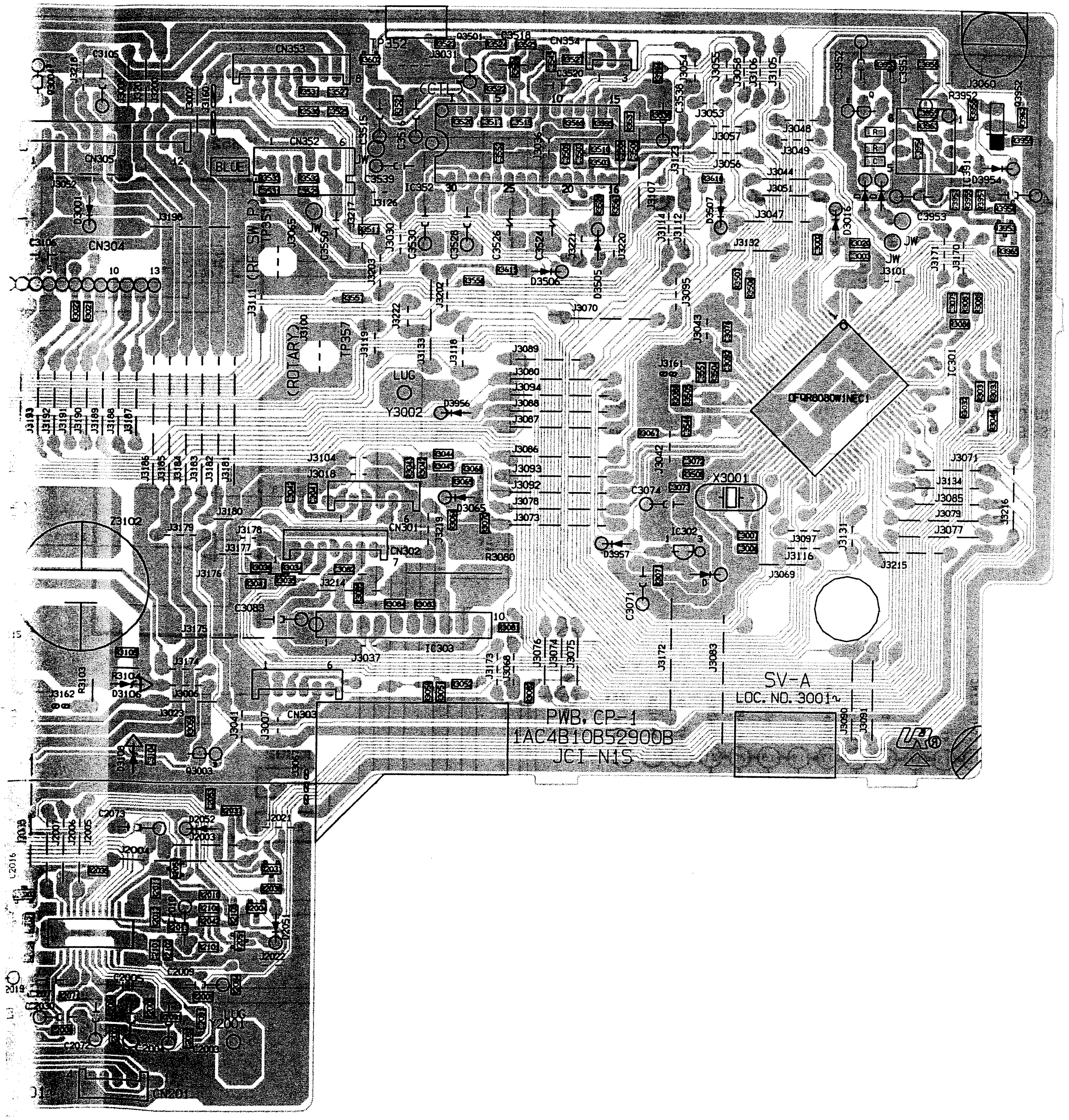
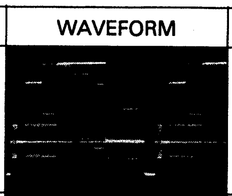
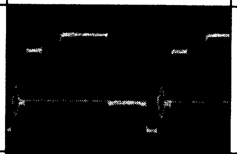
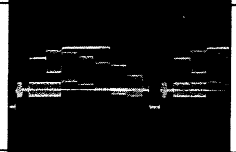
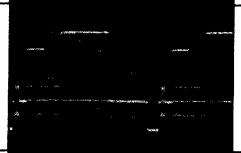
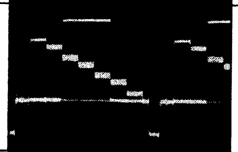
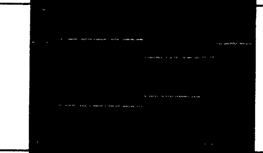
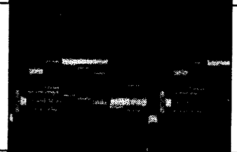
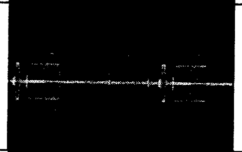
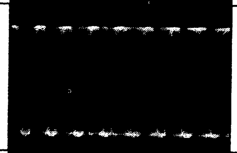
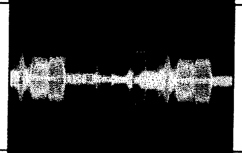
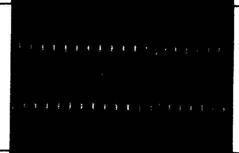
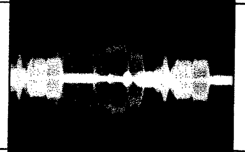
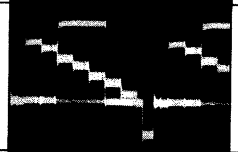
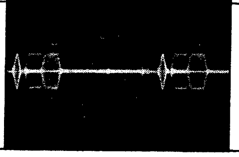
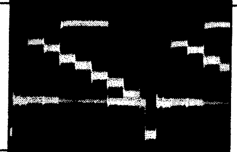
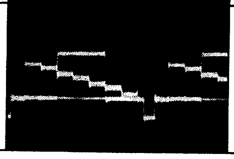
16

CP-1 P.W.B.

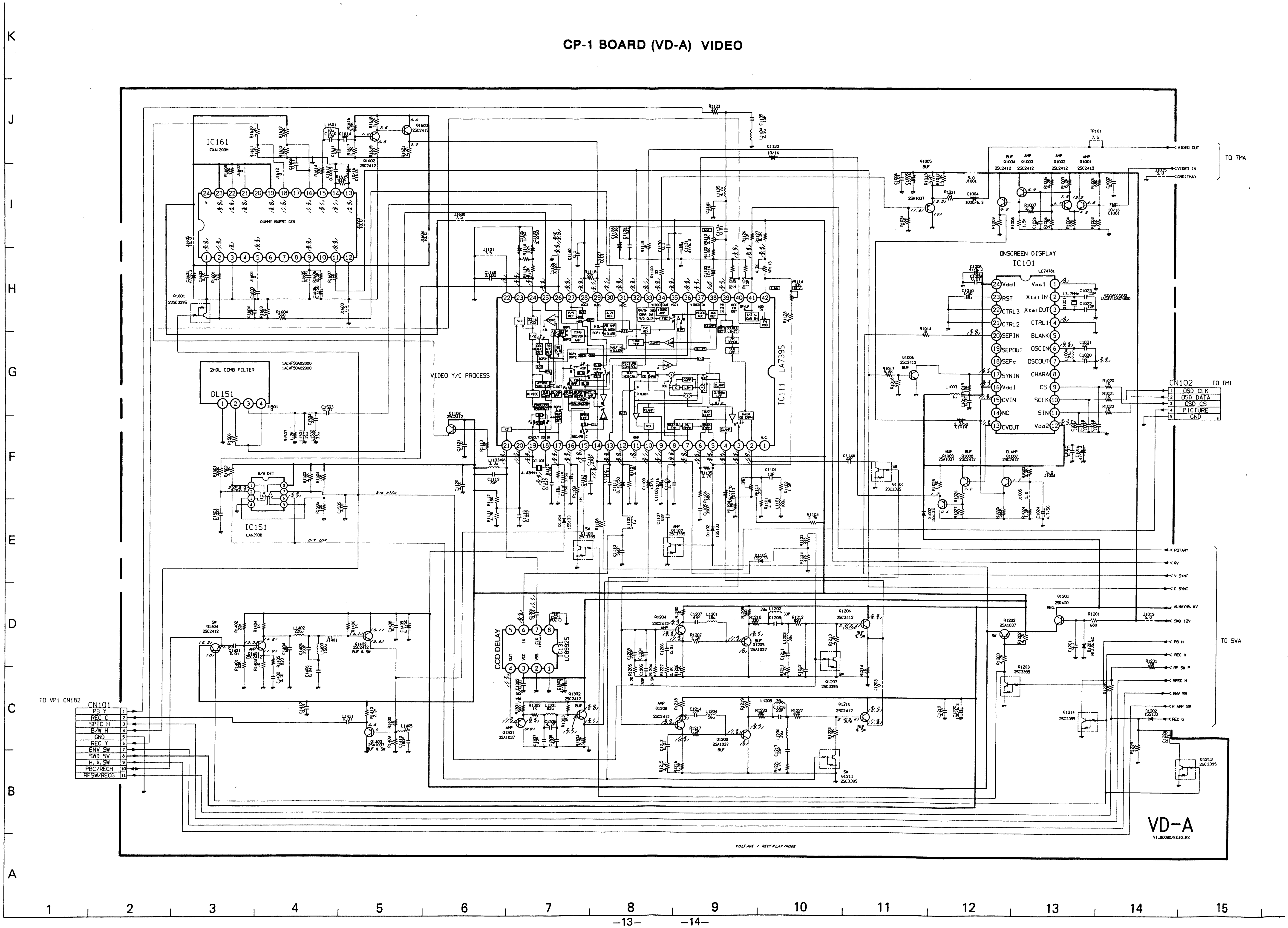

PWB, CP-1
1AC4B10B52900B
JCI-N1S
SV-A
LOC. NO. 3001~
CN353
CN354
CN352
CN305
CN304
CN301
CN302
CN303
IC352
IC301
IC302
IC303
X3001
Y3002
TP352
TP351
TP357
BLUE
(ROTARY)
LUG
R3952
R3060
J3060
C3074
C3071
C3088
Z3102

VIDEO CIRCUIT WAVEFORMS

WF-V-EA

TEST LOCATION	WAVEFORM	MODE/LEVEL	TEST LOCATION	WAVEFORM	MODE/LEVEL
IC111 Pin 37		REC, EE 1 Vp-p	IC111 Pin 34		PB 2 Vp-p
IC111 Pin 3		REC, EE 0.6 Vp-p	IC111 Pin 34		REC, EE 2 Vp-p
IC111 Pin 4		REC, EE 0.5 Vp-p	IC111 (UPPER) Pin 34 (LOWER) Pin 33		STILL (UPPER) 2 Vp-p (LOWER) 5 Vp-p
IC111 Pin 5		REC, EE 1.2 Vp-p	IC111 Pin 15		REC, EE 0.7 Vp-p
IC111 Pin 40		REC, EE 1.0 Vp-p	IC111 Pin 15		PB 0.25 Vp-p
IC111 Pin 39		PB 0.3 Vp-p	IC111 Pin 25		PB 1.0 Vp-p
IC111 Pin 3		PB 0.5 Vp-p	IC111 Pin 31		PB 0.6 Vp-p
IC111 Pin 4		PB 0.5 Vp-p			
IC111 Pins 10/12		PB 0.3 Vp-p			

CP-1 BOARD (VD-A) VIDEO


K
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11
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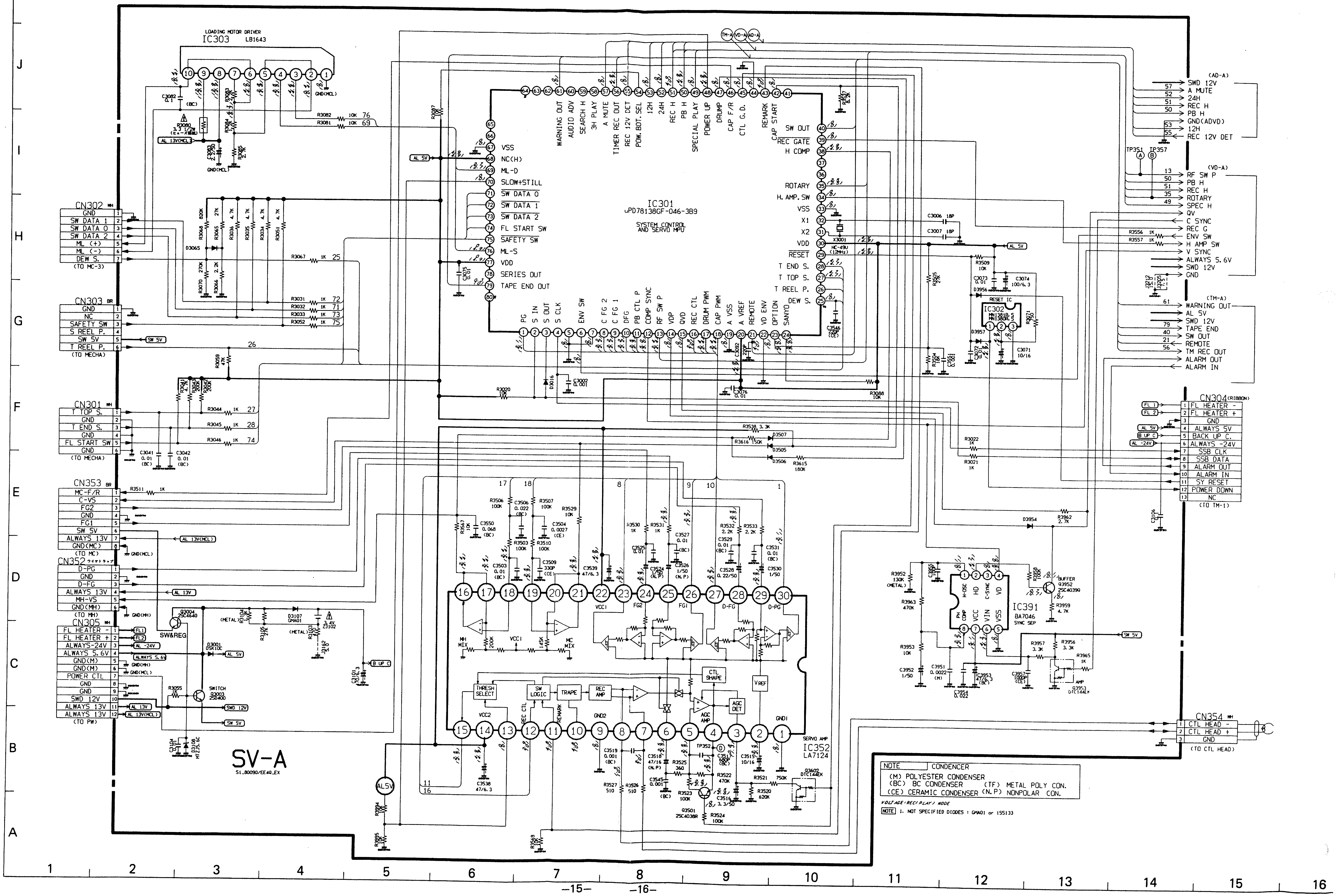
15
IC161
CXA1203M
DUMMY BURST GEN
Q1601
2SC3395
Q1602
2SC2412
Q1603
2SC2412
L1601
2HDL COMB FILTER
DL151
1AC4F50A02800
1AC4F50A02900
B/W DET
B/W HIGH
B/W LOW
IC151
LA6393O
VIDEO Y/C PROCESS
Q1104
2SC2412
IC111
LA7395
X1101
4.43MHz
Q1101
2SC3395
Q1102
2SC3395
AMP
CCD DELAY
IC131
LC89925
Q1301
2SA1037
Q1302
2SC2412
BUF
Q1401
2SC2412
Q1402
2SC2412
Q1403
2SC2412
Q1404
2SC2412
BUF & SW
L1402
220µ
TO VP1 CN182
CN101
PB Y
REC C
SPEC H
B/W H
GND
REC Y
ENV SW
SWD 5V
H. A. SW
PBC/RECH
RFSW/RECG
ONSCREEN DISPLAY
IC101
LC74781
Vdd1
RST
CTRL3
CTRL2
SEPIN
SEPOUT
SEPc
SYNIN
Vdd1
CVIN
NC
CVOUT
Vss1
XtalIN
XtalOUT
CTRL1
BLANK
OSCIN
OSCOUT
CHARA
CS
SCLK
SIN
Vdd2
17.7MHz
CN102
TO TM1
OSD CLK
OSD DATA
OSD CS
PICTURE
GND
Q1001
Q1002
Q1003
Q1004
Q1005
Q1006
2SC2412
2SA1037
TP101
VIDEO OUT
VIDEO IN
GND(TMA)
TO TMA
ROTARY
9V
V SYNC
C SYNC
ALWAYS5.6V
SWD 12V
PB H
REC H
RF SW P
SPEC H
ENV SW
H AMP SW
REC G
TO SVA
Q1201
2SD400
REG
Q1202
2SA1037
Q1203
2SC3395
Q1204
2SC2412
Q1205
2SA1037
Q1206
2SC2412
Q1207
2SC3395
Q1208
2SC2412
Q1209
2SA1037
Q1210
2SC2412
Q1211
2SC3395
Q1213
2SC3395
Q1214
2SC3395
VD-A
VOLTAGE : REC/PLAY MODE
V1_80090/EE4Q_EX

CP-1 BOARD (SV-A) SYSTEM CONTROL & SERVO



K
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16
LOADING MOTOR DRIVER
IC303 LB1643
IC301
μPD78138GF-046-3B9
SYSTEM CONTROL AND SERVO MPU
VSS
NC(H)
ML-D
SLOW+STILL
SW DATA 0
SW DATA 1
SW DATA 2
FL START SW
SAFETY SW
ML-S
VDD
SERIES OUT
TAPE END OUT
WARNING OUT
AUDIO ADV
SEARCH H
3H PLAY
A MUTE
TIMER REC OUT
REC 12V DET
POW.BOT.SEL
12H
24H
REC H
PB H
SPECIAL PLAY
POWER UP
DRUMP
CAP F/R
CTL G.D.
REMARK
CAP START
SW OUT
REC GATE
H COMP
ROTARY
H. AMP. SW
VSS
X1
X2
VDD
RESET
T END S.
T TOP S.
T REEL P.
DEW S.
PG
S IN
S OUT
S CLK
ENV SW
C FG 2
C FG 1
DFG
PB CTL P
COMP SYNC
RF SW P
VDP
QVD
REC CTL
DRUM PWM
CAP PWM
A VSS
A VREF
REMOTE
VD ENV
OPTION
SANYO
X3001 HC-49U (12MHz)
RESET IC
IC302 MN13818-S MN1380R
(AD-A)
SWD 12V
A MUTE
24H
REC H
PB H
GND(ADVD)
12H
REC 12V DET
TP351
TP357
(VD-A)
RF SW P
PB H
REC H
ROTARY
SPEC H
QV
C SYNC
REC G
ENV SW
H AMP SW
V SYNC
ALWAYS 5.6V
SWD 12V
GND
(TM-A)
WARNING OUT
AL 5V
SWD 12V
TAPE END
SW OUT
REMOTE
TM REC OUT
ALARM OUT
ALARM IN
CN302
GND
SW DATA 1
SW DATA 0
SW DATA 2
ML (+)
ML (-)
DEW S.
(TO MC-3)
CN303
GND
NC
SAFETY SW
S REEL P.
SW 5V
T REEL P.
(TO MECHA)
CN301
T TOP S.
GND
T END S.
GND
FL START SW
GND
(TO MECHA)
CN353
MC-F/R
C-VS
FG2
GND
FG1
SW 5V
ALWAYS 13V
GND(MC)
(TO MC)
CN352
D-PG
GND
D-FG
ALWAYS 13V
MH-VS
GND(MH)
(TO MH)
CN305
FL HEATER -
FL HEATER +
ALWAYS-24V
ALWAYS 5.6V
GND(M)
GND(M)
POWER CTL
GND
GND
SWD 12V
ALWAYS 13V
ALWAYS 13V
(TO PW)
SW&REG
Q3004 2SC4640
SWITCH Q3003 2SD400
CN304
FL HEATER -
FL HEATER +
GND
ALWAYS 5V
BACK UP C.
ALWAYS -24V
SSB CLK
SSB DATA
ALARM OUT
ALARM IN
SY RESET
POWER DOWN
NC
(TO TM-1)
CN354
CTL HEAD -
CTL HEAD +
GND
(TO CTL HEAD)
IC391 BA7046 SYNC SEP
H-OSC
HD
C-SYNC
VD
VCC
VIN
VSS
BUFFER Q3952 2SC4039Q
AMP Q3953 DTC144EF
SERVO AMP IC352 LA7124
MH MIX
MC MIX
VCC1
FG2
FG1
D-FG
D-PG
THRESH SELECT
SW LOGIC
TRAPE
REC AMP
CTL SHAPE
VREF
AGC AMP
AGC DET
VCC2
GND2
GND1
REC CTL
REMARK
Q3501 2SC4038R
Q3502 DTC144EK
AL5V
SV-A
S1_80090/EE40_EX

NOTE CONDENCER
(M) POLYESTER CONDENSER
(BC) BC CONDENSER (TF) METAL POLY CON.
(CE) CERAMIC CONDENSER (N.P) NONPOLAR CON.

VOLTAGE:(REC/PLAY) MODE

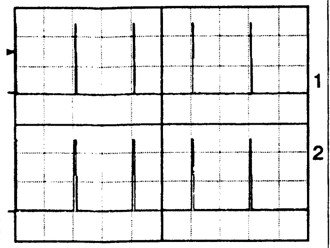
NOTE 1. NOT SPECIFIED DIODES : GMA01 or 1SS133

IC301 SYSTEM CONTROL MPU PIN FUNCTIONS TABLE

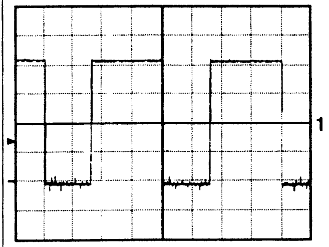
No.	Name	I/O	H/L	I/O Signal Function
1	PG	I	-	Head drum PG pulse input. (Used in servo control and to generate the switching pulse.)
2	S IN	I	-	Mode data communications pin with other microcomputers.
3	S OUT	O	-	Data format : 8bit × 12block serial format.
4	S CLK	O	-	The clock data outputs from this microcomputer.
5	NC	-	-	-
6	ENV SW	I	-	Output comparison signal for main head and sub head.
7	NC	-	-	-
8	CFG 2	I	-	Capstan motor FG-2 pulse input (for capstan "slow").
9	CFG 1	I	-	Capstan motor FG-1 pulse input (for capstan servo).
10	DFG	I	-	Head drum FG pulse input. (for head servo)
11	PB CTL P	I	-	Control (CTL) head playback signal input.
12	COMP SYNC	I	-	Composite synchronizing signal input.
13	RF SW P	I	-	Input of RF switching pulse created by head drum PG.
14	VDP	O	-	Output of vertical synchronizing signal made from composite synchronizing signal.
15	QVD	O	H	Quasi vertical synchronizing signal.
16	REC CTL	O	-	Recording control signal (CTL).
17	DRUM PWM	O	-	Output of head drum motor servo control signal. (pulse with modulation "PWM" signal)
18	CAP PWM	O	-	Output of capstan motor servo control signal. (pulse with modulation "PWM" signal)
19	AVss	-	-	Ground pin for analog circuitry.
20	AVref	-	-	Reference voltage power source pin for analog circuitry.
21	REMOTE	I	-	Remote control signal input.
22	VD ENV	I	-	Video head envelope detection signal input for ATR function.
23	OPTION	I	-	Not used.
24	SY/SAN	I	-	Not used.
25	DEW S	I	H	Dew sensor input pin.
26	T REEL P	I	-	Take up reel moving sensor input.
27	T. TOP S.	I	L	Sensor signal input for tape beginning detection.
28	T. END S.	I	L	Sensor signal input for tape end detection.
29	RESET	I	L	IC initial reset pin. (reset when "LOW")
30	Vdd	-	-	IC power source pin. (5v)
31	X2	-	-	IC clock OSC terminal.
32	X1	-	-	Frequency is 12MHz.
33	Vss	-	-	Ground terminal.
34	H. AMP SW	O	-	Main head and sub head switching signal.
35	ROTARY	O	-	Video head CH1/CH2 confirmation signal. (Used in the processing of image circuit color signals.)
36	NC	-	-	-
37	NC	-	-	-
38	H COMP	O	-	Pulse that corrects the number of drum rotations during 24H recording.
39	REC GATE	O	L	Signal that indicates video head recording timing in the REC mode. Especially in the 24H mode.
40	SW OUT	O	H	Output of signal to "SW OUT" external output pin.
41	NC	-	-	-
42	CAP START	O	-	Capstan motor intermittent drive control pulse (e.g., slow playback).
43	REMARK	O	-	Output at "HIGH" during recording and at "LOW" during playback. (CTL amp control)
44	NC	-	-	-
45	CTL G. D.	O	H	High-speed replay mode (e.g., search) control signal (CTL) amplification speed decrease indication signal.
46	CAP F/R	O	-	Capstan motor rotation direction (normal/reverse) indication signal. (reverse; "H")
47	DRUM P	O	-	Special playback (e.g., slow playback) jitter prevention signal.
48	POWER UP	O	H	Power source ON/OFF signal. ("H" when on)
49	SPECIAL PLAY	O	H	Special playback mode (e.g., search, slow, still) indication signal.
50	PB H	O	H	Signal for indicating playback mode.
51	REC H	O	H	Signal for indicating recording mode.
52	24H	O	H	Output "H" during recording or playback in the 24H mode.
53	12H	O	H	Output "H" during recording or playback in the 12H mode.
54	POWER OPTION	I	-	Option for power source button.
55	REC 12V DET	I	H	REC mode indication signal input.
56	TIMER REC OUT	O	L	Timer recording mode indication signal.
57	A. MUTE	O	H	Signal disable audio signal output.
58	3H PLAY	O	H	3H delay circuit control signal.
59	SEARCH H	O	H	CUE or REVIEW mode indication signal.
60	NC	-	-	-
61	WARNING OUT	O	L	Warning signal output pin.
62	NC	-	-	-
63	NC	-	-	-
64	NC	-	-	-
65	NC	-	-	-
66	NC	-	-	-
67	Vss	-	-	Ground terminal.
68	NC	-	-	-
69	ML - D	O	-	Loading motor rotation direction indication signal. (load "H", brake "M", unload "L")
70	SLOW + STILL	O	H	Slow/still mode indication signal.
71	SW DATA 0	I	L	
72	SW DATA 1	I	L	Input of the three-bit signal that indicates mechanism operational position.
73	SW DATA 2	I	L	
74	FL START SW	I	L	Terminal for detecting the start of cassette loading or discharge by cassette mechanism .
75	SAFETY SW	I	L	Terminal for detecting accidental erasure prevention tab of cassette tape.
76	ML - SPEED	O	-	Loading motor rotation speed (high / medium / low) indication signal.
77	Vdd	-	-	IC power source pin. (5v)
78	SERIES OUT	O	H	Series REC mode indication signal.
79	TAPE END OUT	O	L	Output when "T.END.S" is input during recording.
80	NC	-	-	-

EE4Q_TS

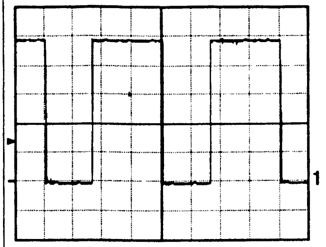
SERVO CIRCUIT WAVEFORMS



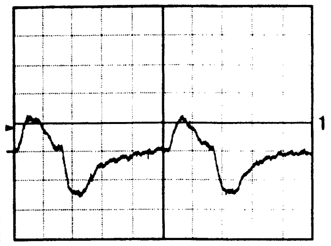
1. IC301-14
2. IC301-15
2V/10ms/div
[STILL]



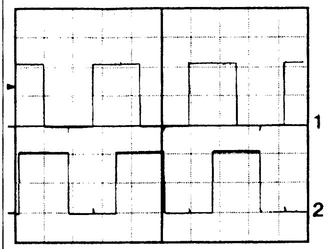
1. IC351-15
1V/10ms/div
[PLAY]



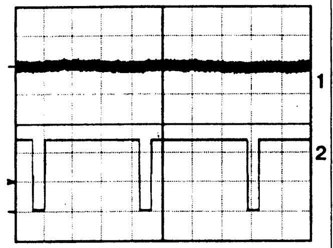
1. IC351-12
1V/10ms/div
[REC]



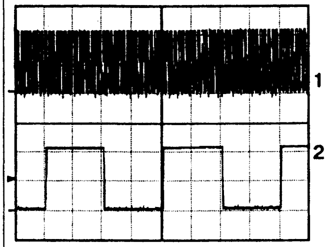
1. IC351-16 (D-Vs)
50mV/20ms/div
[INT REC, SLOW]



1. IC351-26
2. IC351-23
2V/200μs/div
[REC, PLAY]



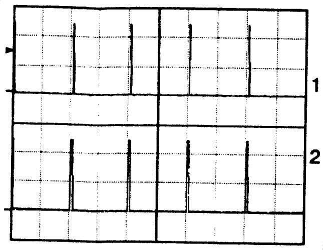
1. IC351-21 (C-Vs)
100mV/50ms/div
2. IC351-39 (RECGATE)
2V/50ms/div
[INT REC, SLOW]



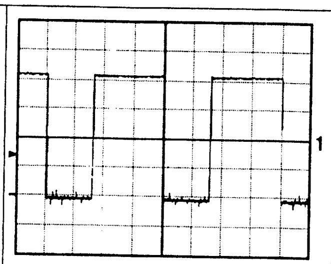
1.IC351-27
2.IC351-30
2V/10ms/div
[REC, PLAY]

WF-S-EE4QEX

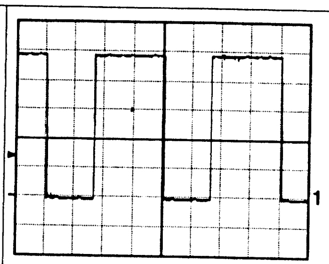
SERVO CIRCUIT WAVEFORMS



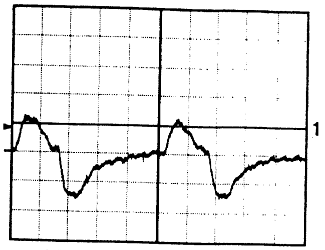
1. IC301-14
2. IC301-15
2V/10ms/div
[STILL]



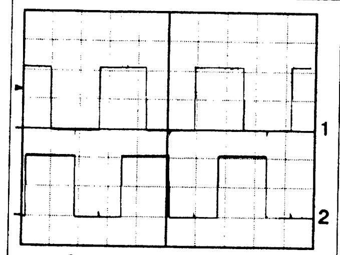
1. IC351-15
1V/10ms/div
[PLAY]



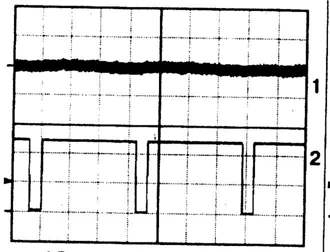
1. IC351-12
1V/10ms/div
[REC]



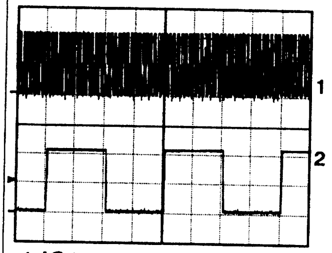
1. IC351-16 (D-Vs)
50mV/20ms/div
[INT REC, SLOW]



1. IC351-26
2. IC351-23
2V/200μs/div
[REC, PLAY]



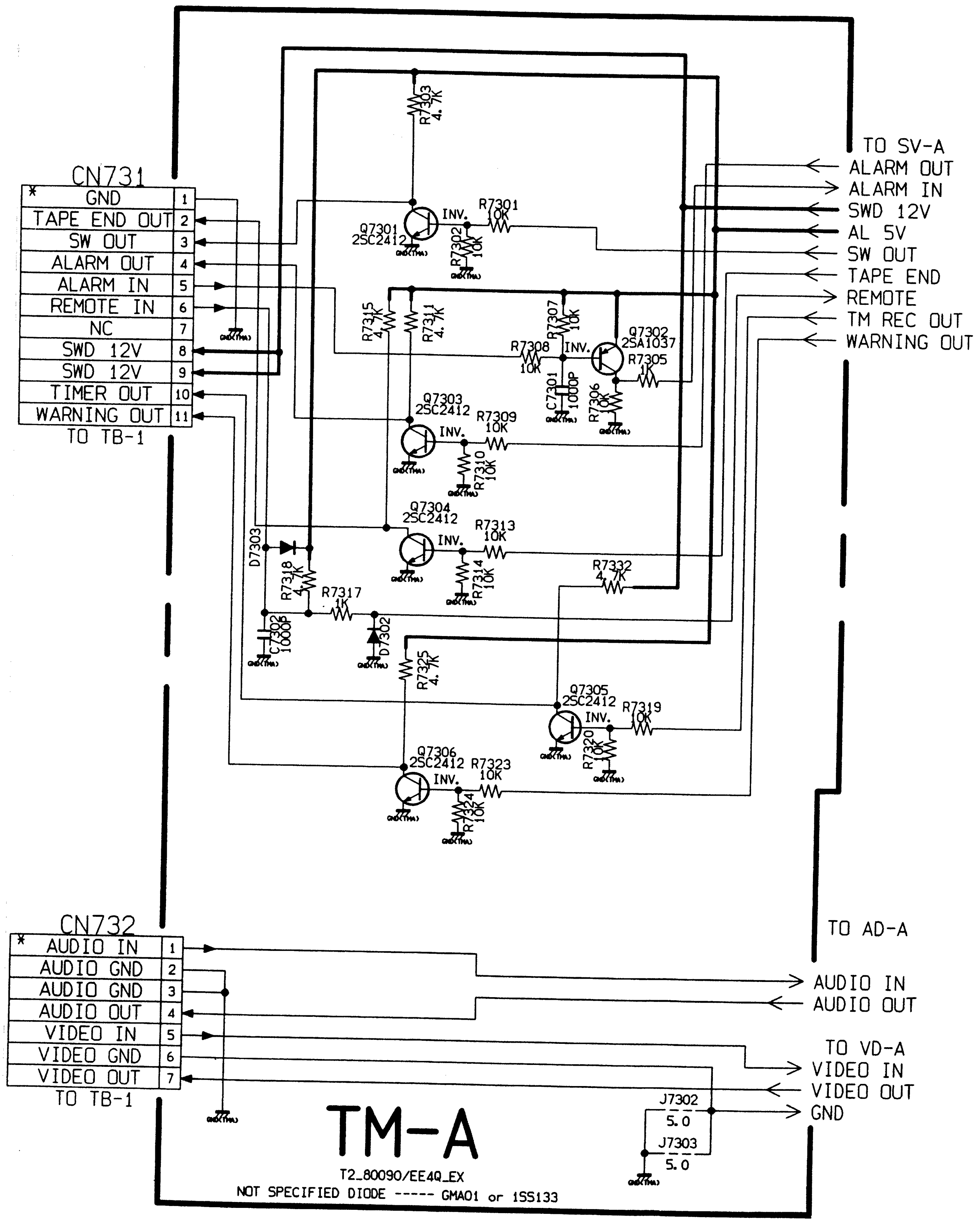
1. IC351-21 (C-Vs)
100mV/50ms/div
2. IC351-39 (RECGATE)
2V/50ms/div
[INT REC, SLOW]



1.IC351-27
2.IC351-30
2V/10ms/div
[REC, PLAY]

WF-S-EE4QEX

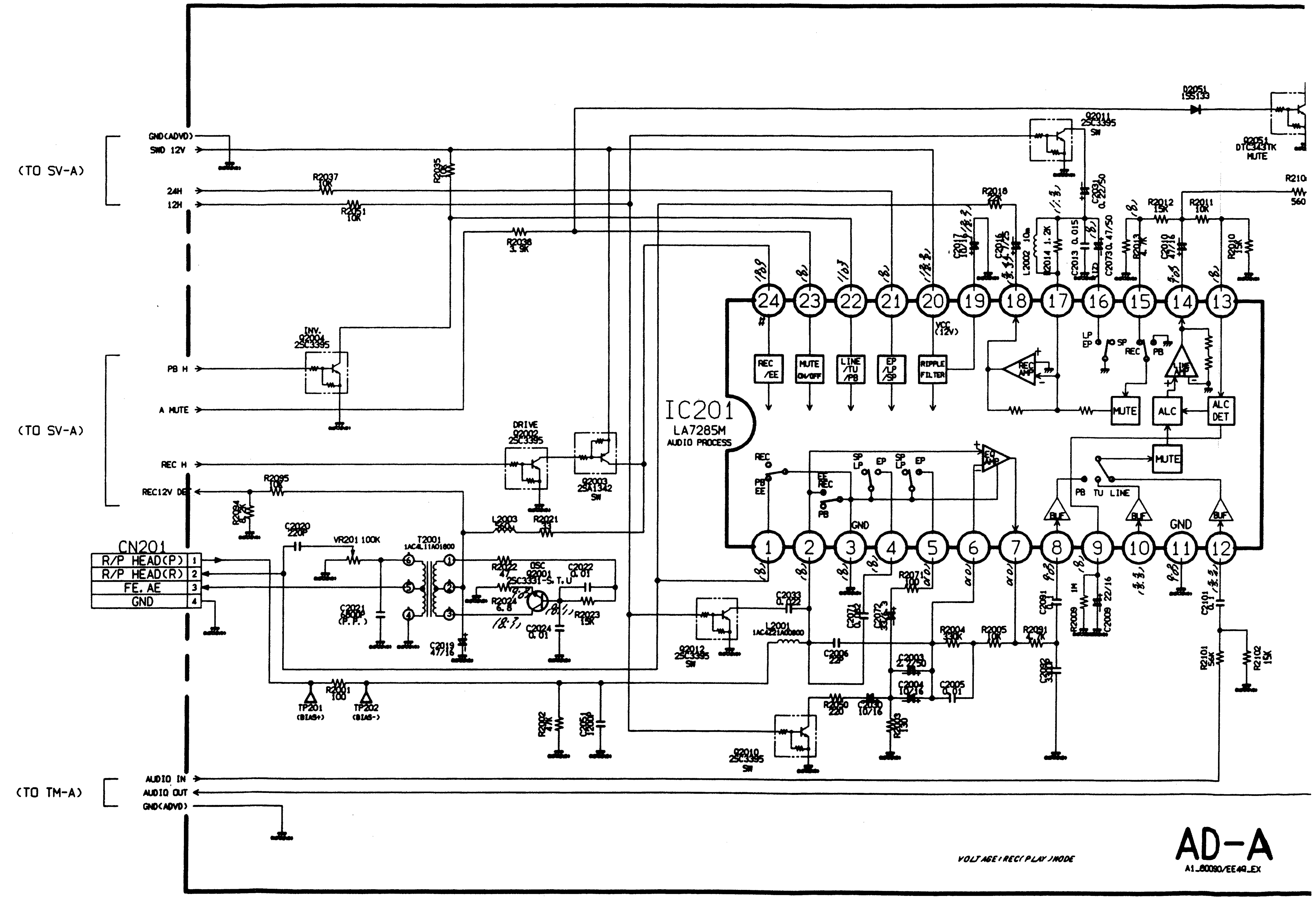
CP-1 BOARD (TM-A) TIMER


CN731
*
GND 1
TAPE END OUT 2
SW OUT 3
ALARM OUT 4
ALARM IN 5
REMOTE IN 6
NC 7
SWD 12V 8
SWD 12V 9
TIMER OUT 10
WARNING OUT 11
TO TB-1
TO SV-A
ALARM OUT
ALARM IN
SWD 12V
AL 5V
SW OUT
TAPE END
REMOTE
TM REC OUT
WARNING OUT
R7303 4.7K
Q7301 2SC2412
INV.
R7301 10K
R7302 10K
R7315 4.7K
R7311 4.7K
R7307 10K
R7308 10K
INV.
Q7302 2SA1037
R7305 1K
C7301 1000P
R7306 10K
Q7303 2SC2412
INV.
R7309 10K
R7310 10K
Q7304 2SC2412
INV.
R7313 10K
R7314 10K
D7303
R7318 4.7K
R7317 1K
C7302 1000P
D7302
R7332 4.7K
R7325 4.7K
Q7305 2SC2412
INV.
R7319 10K
R7320 10K
Q7306 2SC2412
INV.
R7323 10K
R7324 10K
GND(TM-A)
CN732
*
AUDIO IN 1
AUDIO GND 2
AUDIO GND 3
AUDIO OUT 4
VIDEO IN 5
VIDEO GND 6
VIDEO OUT 7
TO TB-1
TO AD-A
AUDIO IN
AUDIO OUT
TO VD-A
VIDEO IN
VIDEO OUT
GND
J7302 5.0
J7303 5.0
TM-A
T2_80090/EE4Q_EX

NOT SPECIFIED DIODE ----- GMA01 or 1SS133

K
J
I
H
G
F
E
D
C
B
A

CP-1 BOARD (AD-A) AUDIO

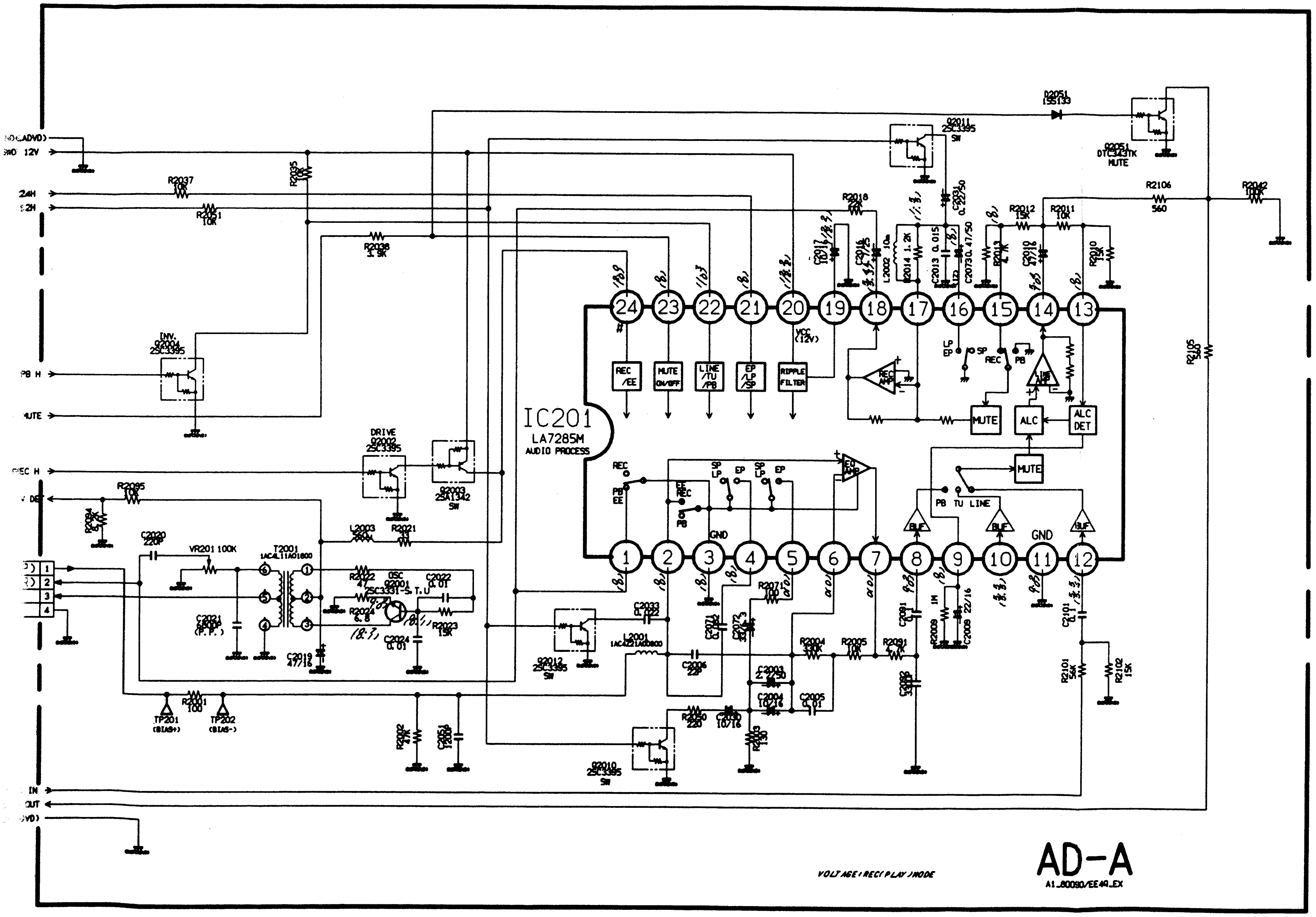

(TO SV-A)
GND(ADVD)
SWD 12V
24H
12H
R2037 10K
R2051 10K
R2035 10K
R2038 1.5K
(TO SV-A)
PB H
A MUTE
REC H
REC12V DET
INV. Q2004 2SC3395
DRIVE Q2002 2SC3395
Q2003 2SA1342 SW
R2095 10K
R2094 4.7K
CN201
R/P HEAD(P) 1
R/P HEAD(R) 2
FE. AE 3
GND 4
C2020 220P
VR201 100K
T2001 1AC4L11A01800
C2021 6800P (P.P.)
L2003 560μ
R2021 33
R2022 47
OSC Q2001 2SC3331-S.T.U
C2022 0.01
R2024 6.8
R2023 15K
C2024 0.01
C2019 47/16
R2001 100
TP201 (BIAS+)
TP202 (BIAS-)
R2002 47K
C2051 120P
IC201
LA7285M
AUDIO PROCESS
REC /EE
MUTE ON/OFF
LINE /TU /PB
EP /LP /SP
RIPPLE FILTER
VCC (12V)
REC AMP
LINE AMP
MUTE
ALC
ALC DET
EQ AMP
BUF
PB TU LINE
GND
LP EP
SP
REC
PB
EE REC
PB EE
Q2011 2SC3395 SW
D2051 1SS133
Q2051 DTC343TK MUTE
R2104 560
R2018 22K
C2017 10/16
C2016 4.7/25
L2002 10m
R2014 1.2K
C2013 0.015
C2031 0.22/50
C2073 0.47/50
R2013 4.7K
R2012 15K
R2011 10K
C2010 47/16
R2010 15K
Q2012 2SC3395 SW
C2033 0.022
L2001 1AC4Z21A00800
C2006 22P
C2071
C2072
R2071 100
R2004 330K
R2005 10K
R2091 4.7K
C2091 0.1
R2009 1M
C2009 22/16
C2092 330P
C2003 2.2/50
C2004 10/16
C2005 0.01
R2050 220
C2030 10/16
R2003 130
Q2010 2SC3395 SW
C2101 0.1
R2101 56K
R2102 15K
(TO TM-A)
AUDIO IN
AUDIO OUT
GND(ADVD)
VOLTAGE:REC(PLAY)MODE
AD-A
A1_80080/EE40_EX

LA7

21PIN
22PIN
23PIN
24PIN

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

CP-1 BOARD (AD-A) AUDIO

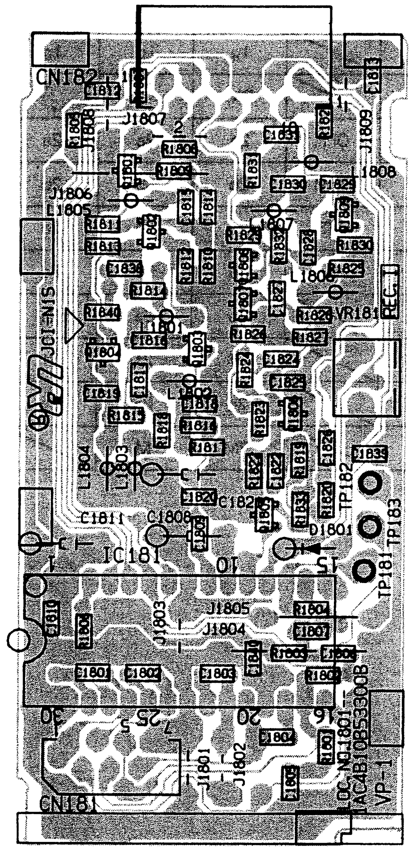

GND(ADVD)
GND 12V
24H
12H
PB H
MUTE
REC H
V DET
IN
OUT
(ADVD)
R2037 10K
R2051 10K
R2035 10K
R2038 1.5K
INV. Q2004 2SC3395
DRIVE Q2002 2SC3395
Q2003 2SA1342 SW
R2095 10K
R2094
C2020 220P
VR201 100K
T2001 1AC4L11A01800
L2003 560µ
R2021 33
R2022 47
OSC Q2001 2SC3331-S.T.U
C2022 0.01
R2024 6.8
R2023 15K
C2024 0.01
C2021 6800P (P.P.)
C2019 47/16
R2001 100
TP201 (BIAS+)
TP202 (BIAS-)
R2002 47K
C2051 1200P
Q2012 2SC3395 SW
C2033 0.022
L2001 1AC4Z21A00800
C2006 22P
C2071
C2072
R2071 100
C2003 2.2/50
C2004 10/16
C2005 0.01
R2050 220
C2030 10/16
R2003 130
Q2010 2SC3395 SW
R2004 330K
R2005 10K
R2091 4.7K
C2092 330P
C2091 0.1
R2009 1M
C2009 22/16
C2101 0.1
R2101 56K
R2102 15K
IC201
LA7285M
AUDIO PROCESS
REC /EE
MUTE ON/OFF
LINE /TU /PB
EP /LP /SP
RIPPLE FILTER
VCC (12V)
REC AMP
LINE AMP
MUTE
ALC
ALC DET
EQ AMP
BUF
REC
PB EE
EE REC
PB
SP LP
EP
LP EP
SP
PB TU LINE
GND
Q2011 2SC3395 SW
D2051 1SS133
Q2051 DTC343TK MUTE
R2018 22K
C2017 10/16
C2016 4.7/25
L2002 10m
R2014 1.2K
C2013 0.015
C2031 0.22/50
C2073 0.47/50
R2012 15K
R2011 10K
R2013 4.7K
C2010 47/16
R2010 15K
R2106 560
R2042 100K
R2105 560
1.8.9
1.8
1.0.3
1.2.3
3.9.5
1.5.3
9.05
9.8
5.5
10.0
VOLTAGE : REC(PLAY)MODE
AD-A
A1_80090/EE49_EX

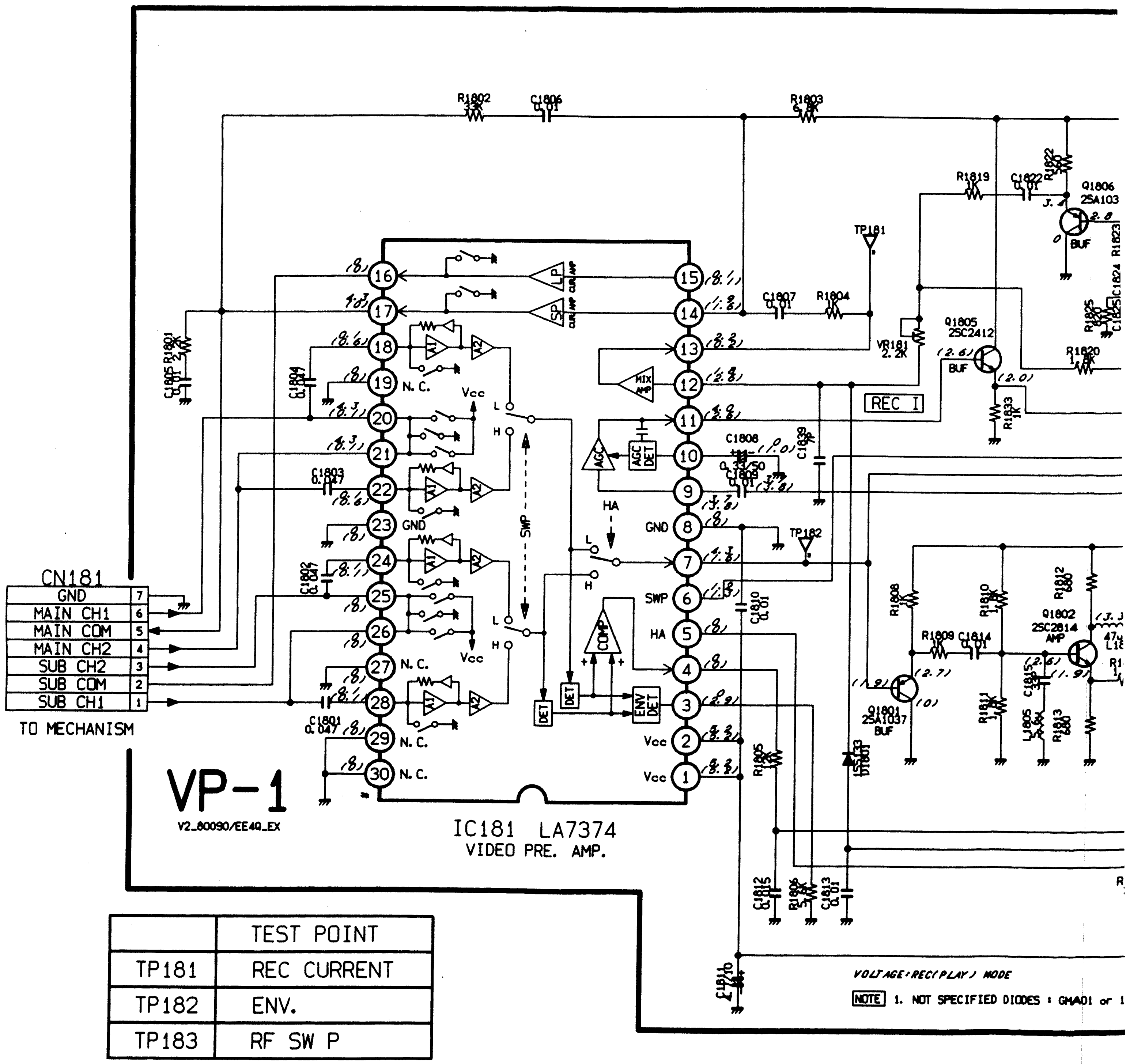
LA7285M LOGIC

21PIN	SP	LP	EP
	0-1	1.8-2.6	3.6-Vcc
22PIN	PB	TU	LINE
	0-1	1.8-2.6	3.6-Vcc
23PIN	MUTE Off	MUTE ON	
	0-1.5	2.5-Vcc	
24PIN	EE	REC	
	0-1	3.0-Vcc	

VP-1 BOARD VIDEO PRE

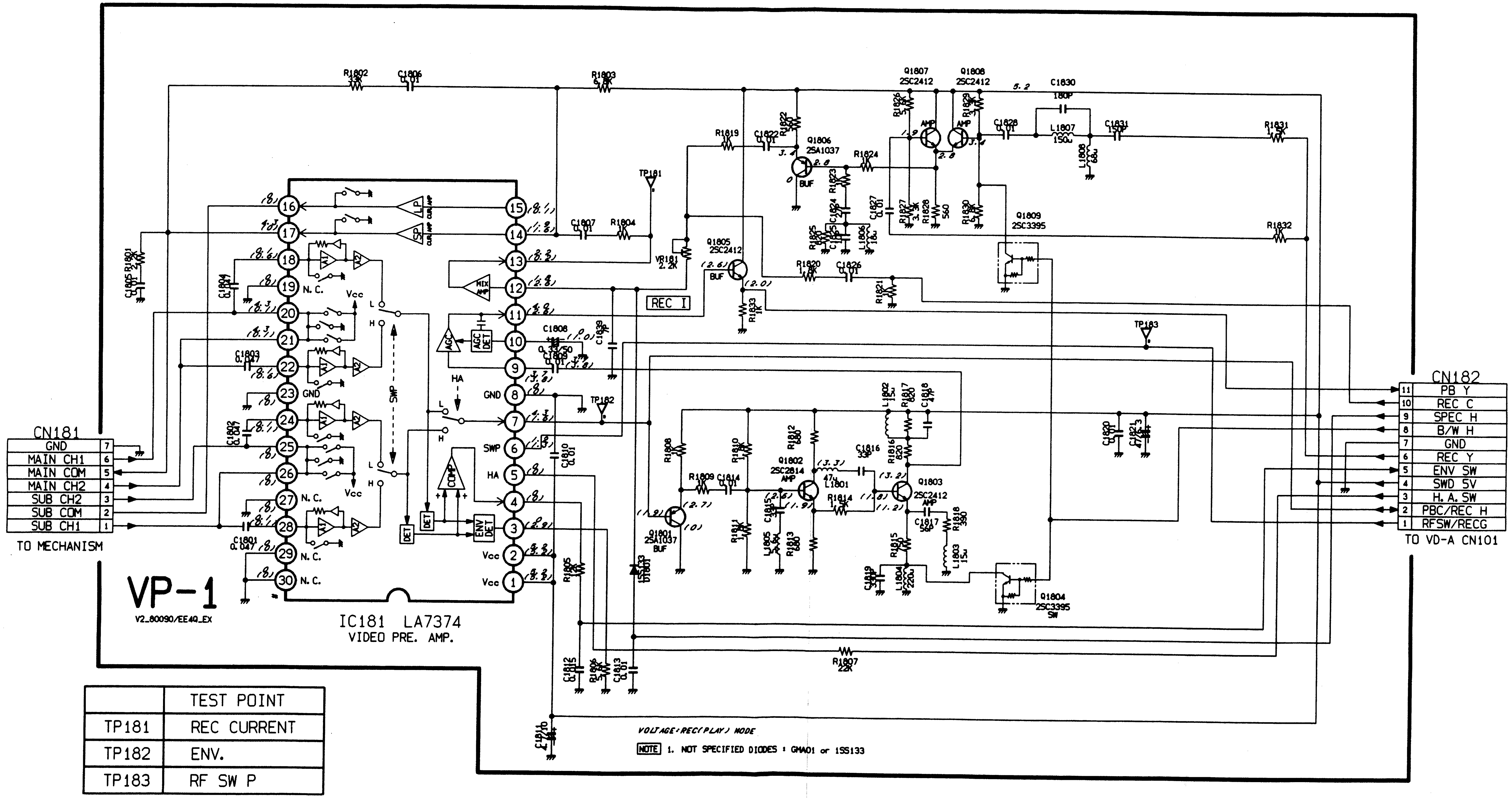
VP-1 P.W.B.


CN182
CN181
IC181
VR181
REC I
TP181
TP182
TP183
D1601
LOC.NO.1801
VP-1


CN181
GND 7
MAIN CH1 6
MAIN COM 5
MAIN CH2 4
SUB CH2 3
SUB COM 2
SUB CH1 1
TO MECHANISM
VP-1
V2_80090/EE4Q_EX
IC181 LA7374
VIDEO PRE. AMP.
R1802 33K
C1806 0.01
R1803 6.8K
R1819 1K
C1822 0.01
R1822 560
Q1806 2SA103
BUF
TP181
C1807 0.01
R1804 1K
VR181 2.2K
Q1805 2SC2412
BUF
R1820 1.8K
R1833 1K
REC I
C1808 4.7/50
C1809 0.01
C1839 7P
TP182
C1810 0.01
R1808
R1810 1.8K
R1812 680
R1809 1K
C1814 0.01
Q1802 2SC2814
AMP
Q1801 2SA1037
BUF
R1811
L1805
C1815
R1813 680
R1805
D1803 1SS133
C1812
R1806
C1813 0.01
C1811
C1805 0.01
R1801 2.2K
C1804 0.047
C1803 0.047
C1802 0.047
C1801 0.047
N.C.
Vcc
GND
SWP
HA
AGC
AGC DET
MIX AMP
COMP
DET
ENV DET
VOLTAGE: REC(PLAY) MODE
NOTE 1. NOT SPECIFIED DIODES : GMA01 or 1

	TEST POINT
TP181	REC CURRENT
TP182	ENV.
TP183	RF SW P

VP-1 BOARD VIDEO PRE-AMP


VP-1
V2_80090/EE4Q_EX
IC181 LA7374
VIDEO PRE. AMP.
CN181
GND 7
MAIN CH1 6
MAIN COM 5
MAIN CH2 4
SUB CH2 3
SUB COM 2
SUB CH1 1
TO MECHANISM
CN182
11 PB Y
10 REC C
9 SPEC H
8 B/W H
7 GND
6 REC Y
5 ENV SW
4 SWD 5V
3 H.A.SW
2 PBC/REC H
1 RFSW/RECG
TO VD-A CN101
TP181
TP182
TP183
REC I
Q1801 2SA1037 BUF
Q1802 2SC2814 AMP
Q1803 2SC2412 AMP
Q1804 2SC3395 SW
Q1805 2SC2412 BUF
Q1806 2SA1037 BUF
Q1807 2SC2412 AMP
Q1808 2SC2412 AMP
Q1809 2SC3395
VR181 2.2K
D1801 1SS133
AGC
AGC DET
MIX AMP
COMP
ENV DET
DET
SWP
HA
Vcc
GND
N.C.

VOLTAGE: REC(PLAY) MODE

NOTE 1. NOT SPECIFIED DIODES : GMA01 or 1SS133

	TEST POINT
TP181	REC CURRENT
TP182	ENV.
TP183	RF SW P

K

J

I

H

G

F

E

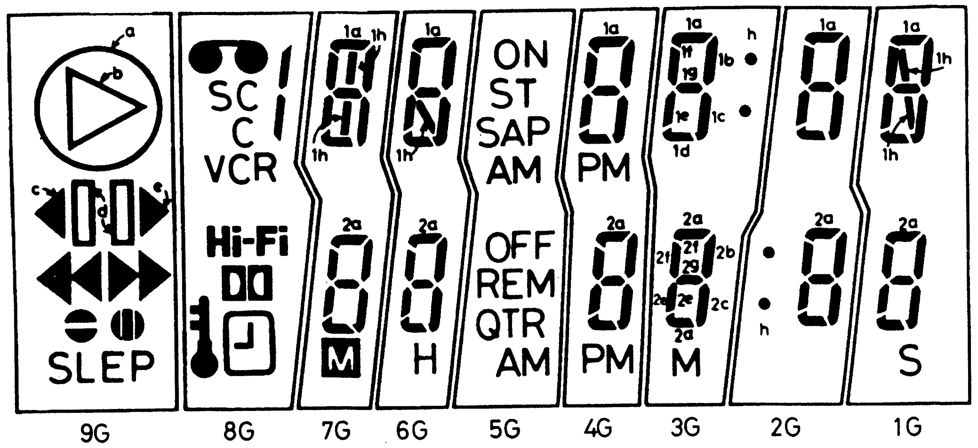
D

C

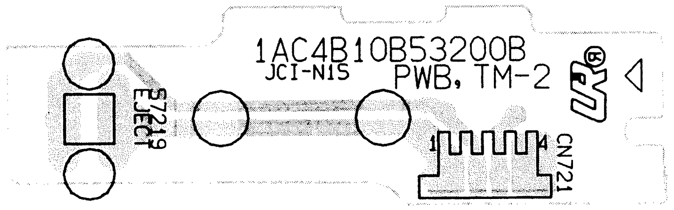
B

A

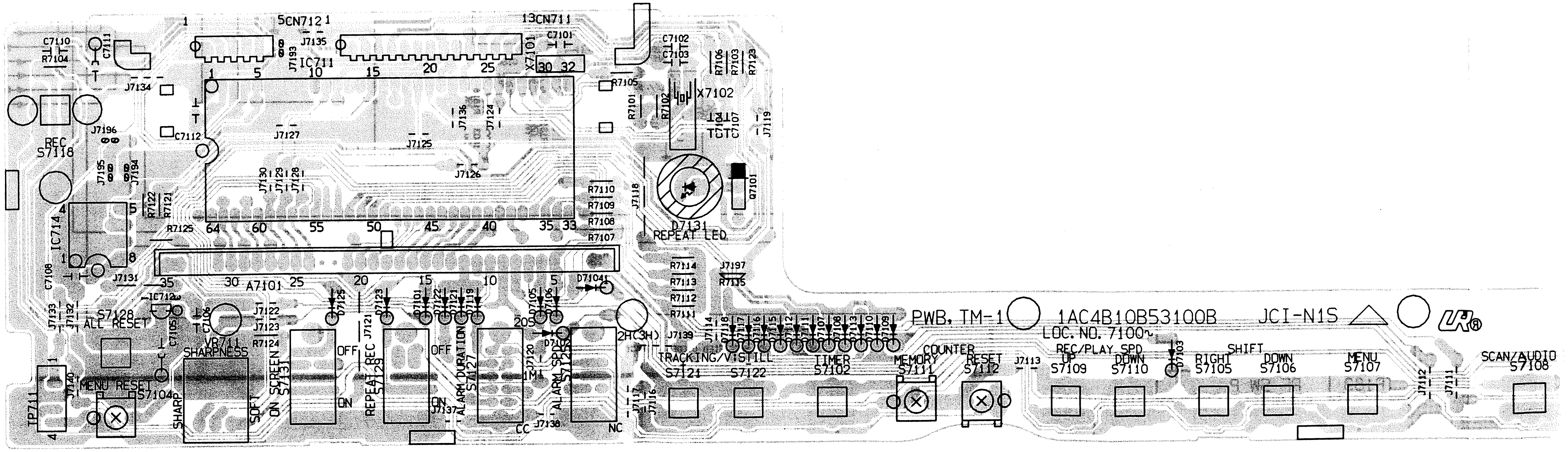
A7101 DISPLAY (FLD) GRID/ANODE ASSI


SC
C
VCR
Hi-Fi
SLEP
ON
ST
SAP
AM
PM
OFF
REM
QTR
AM
PM
M
H
M
S
9G
8G
7G
6G
5G
4G
3G
2G
1G

TM-2 P.W.B.

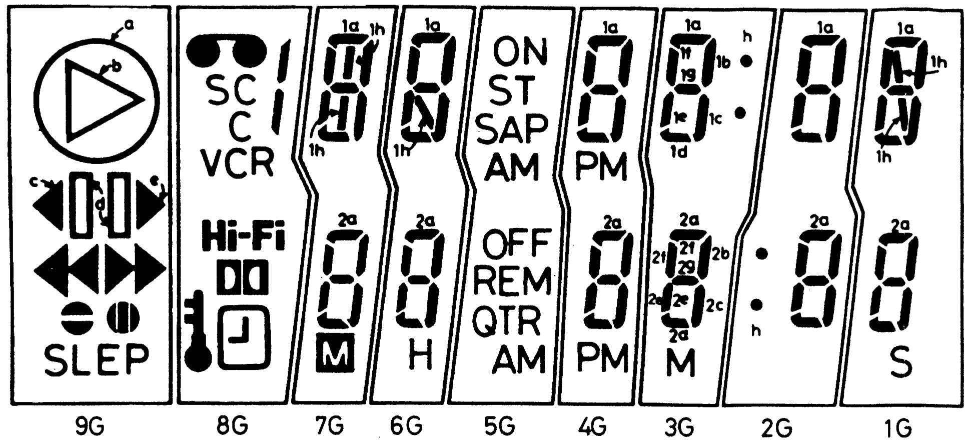

1AC4B10B53200B
JCI-N15
PWB, TM-2
EJECT
S7219
CN721

TM-1 P.W.B.


CN712
CN711
IC711
X7101
X7102
IC714
A7101
REC
S7118
ALL RESET
S7128
MENU RESET
S7104
VR711
SHARPNESS
SHARP
SOFT
ON SCREEN
S7131
REPEAT REC
S7129
ALARM DURATION
S7127
ALARM SPD
S7125
D7131
REPEAT LED
TRACKING/V.STILL
S7121
S7122
TIMER
S7102
COUNTER
MEMORY
S7111
RESET
S7112
REC/PLAY SPD
UP
S7109
DOWN
S7110
SHIFT
RIGHT
S7105
DOWN
S7106
MENU
S7107
SCAN/AUDIO
S7108
TP711
PWB, TM-1
1AC4B10B53100B
JCI-N1S
LOC. NO. 7100~

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

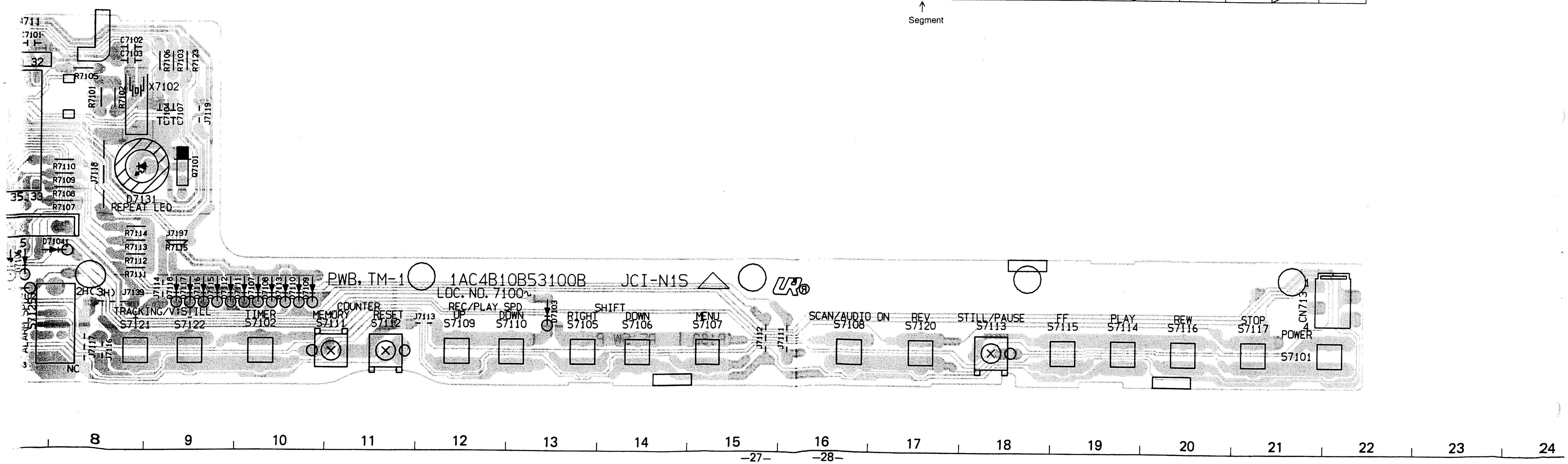
A7101 DISPLAY (FLD) GRID/ANODE ASSIGNMENT DRAWING & TABLE


SC
C
VCR
Hi-Fi
SLEP
ON
ST
SAP
AM
OFF
REM
QTR
AM
PM
PM
H
M
S
9G
8G
7G
6G
5G
4G
3G
2G
1G

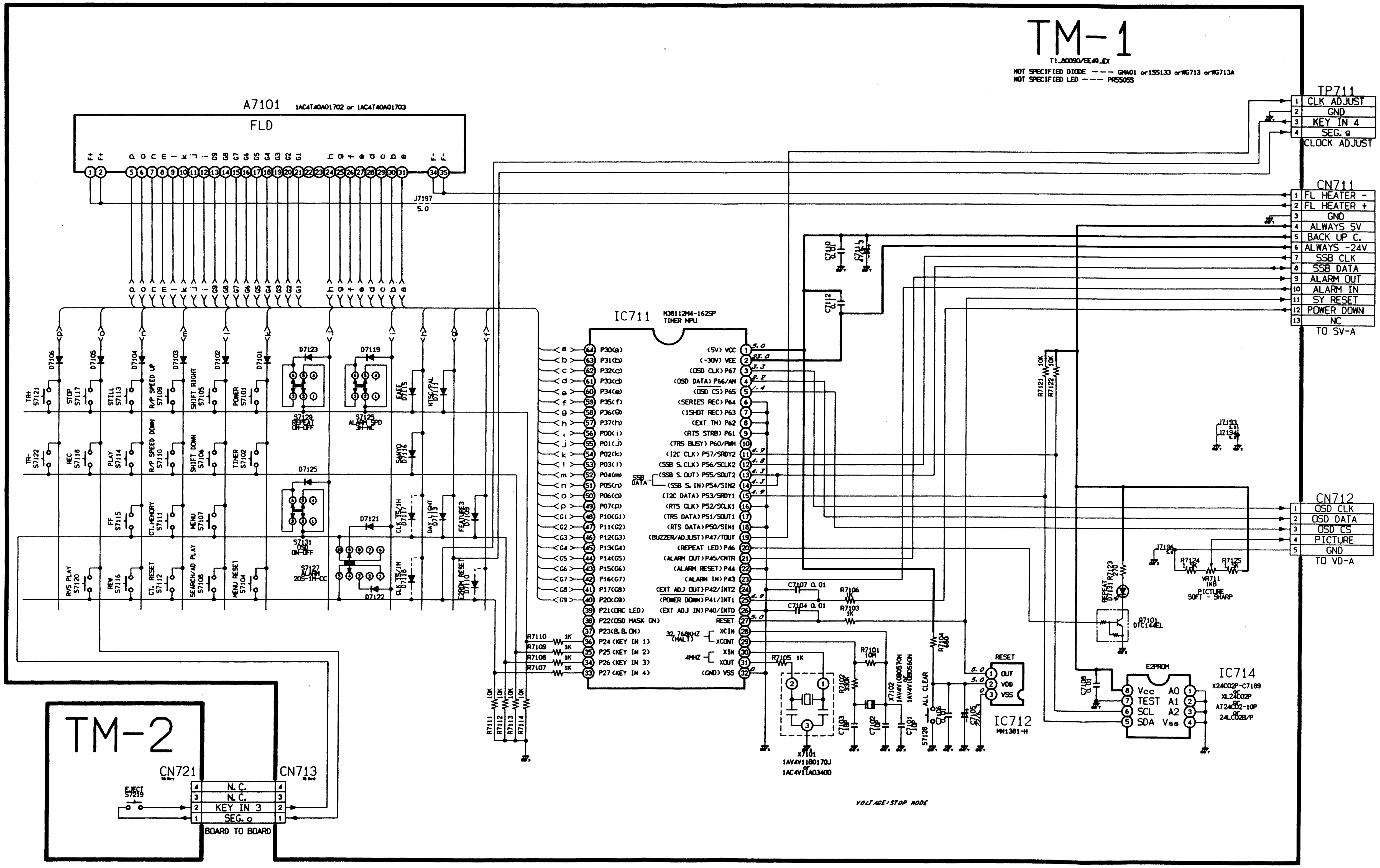
	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	○	●●	1a	1a	ON	1a	1a	1a	1a
b	▷	SC	1b	1b	ST	1b	1b	1b	1b
c	◀	/	1c	1c	SAP	1c	1c	1c	1c
d	▯▯	C	1d	1d	AM	1d	1d	1d	1d
e	▶	VCR	1e	1e		1e	1e	1e	1e
f			1f	1f		1f	1f	1f	1f
g			1g	1g		1g	1g	1g	1g
h			1h	1h		PM	:	:	1h
i	◀◀	DD	2a	2a	OFF	2a	2a	2a	2a
j	▶▶	Hi-Fi	2b	2b	REM	2b	2b	2b	2b
k	⊖	🌡	2c	2c	QTR	2c	2c	2c	2c
l	◍	🕒	2d	2d	AM	2d	2d	2d	2d
m	S		2e	2e		2e	2e	2e	2e
n	L		2f	2f		2f	2f	2f	2f
o	E		2g	2g		2g	2g	2g	2g
p	P		M	H		PM	M		S

← Grid

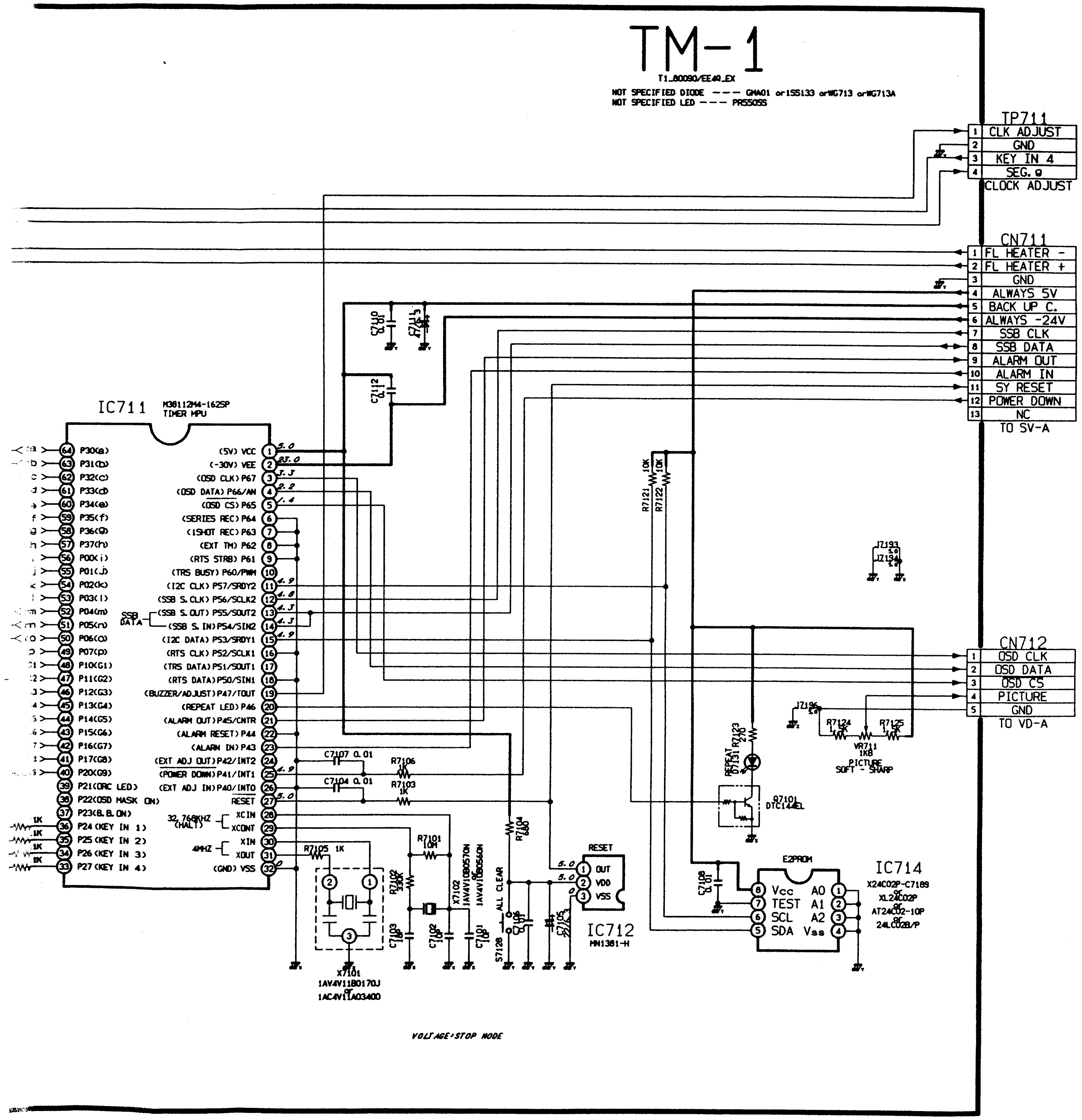
↑
Segment


C7101
C7102
C7103
R7105
R7106
R7103
R7123
R7101
R7102
X7102
C7104
C7107
J7119
R7110
R7109
R7108
R7107
J7118
Q7101
D7131
REPEAT LED
R7114
R7113
R7112
R7111
J7197
R7115
D7104
J7106
2H(3H)
J7139
J7114
PWB, TM-1
1AC4B10B53100B
JCI-N1S
LOC. NO. 7100~
TRACKING/V.STILL
S7121
S7122
TIMER
S7102
MEMORY
S7111
COUNTER
RESET
S7112
J7113
REC/PLAY SPD
UP
S7109
DOWN
S7110
D7103
SHIFT
RIGHT
S7105
DOWN
S7106
MENU
S7107
J7112
J7111
SCAN/AUDIO ON
S7108
REV
S7120
STILL/PAUSE
S7113
FF
S7115
PLAY
S7114
REW
S7116
STOP
S7117
POWER
S7101
CN7131
ALARM SPEED
S7125
J7117
J7116
NC
32
35
33
5
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

TM-1, 2 BOARD TIMER, DISPLAY (FLD) & SWITCH


TM-1
NOT SPECIFIED DIODE --- GMA01 or 1SS133 or MG713 or MG713A
NOT SPECIFIED LED --- PR5505S
A7101 1AC4T40A01702 or 1AC4T40A01703
FLD
IC711 M38112M4-162SP TIMER MPU
TP711
CLK ADJUST
GND
KEY IN 4
SEG. g
CLOCK ADJUST
CN711
FL HEATER -
FL HEATER +
GND
ALWAYS 5V
BACK UP C.
ALWAYS -24V
SSB CLK
SSB DATA
ALARM OUT
ALARM IN
SY RESET
POWER DOWN
NC
TO SV-A
CN712
OSD CLK
OSD DATA
OSD CS
PICTURE
GND
TO VD-A
IC712 MN1381-H
RESET
IC714 X24C02P-C7189 XL24C02P AT24C02-10P 24LC02B/P
E2PROM
X7101 1AV4V11B0170J 1AC4V11A03400
VR711 1KB PICTURE SOFT - SHARP
Q7101 DTC144EL
ALL CLEAR
SSB DATA
TR+ S7121
STOP S7117
STILL S7113
R/P SPEED UP S7109
SHIFT RIGHT S7105
POWER S7101
TR- S7122
REC S7118
PLAY S7114
R/P SPEED DOWN S7110
SHIFT DOWN S7106
TIMER S7102
FF S7115
CT.MEMORY S7111
MENU S7107
RVS PLAY S7120
REW S7116
CT. RESET S7112
SEARCH/AD PLAY S7108
MENU RESET S7104
S7129 REPEAT ON-OFF
S7125 ALARM SPD 3H-NC
S7131 OSD ON-OFF
S7127 ALARM 20S-1M-CC
VOLTAGE: STOP MODE
TM-2
CN721
CN713
EJECT S7219
N.C.
N.C.
KEY IN 3
SEG. o
BOARD TO BOARD

ARD TIMER, DISPLAY (FLD) & SWITCH

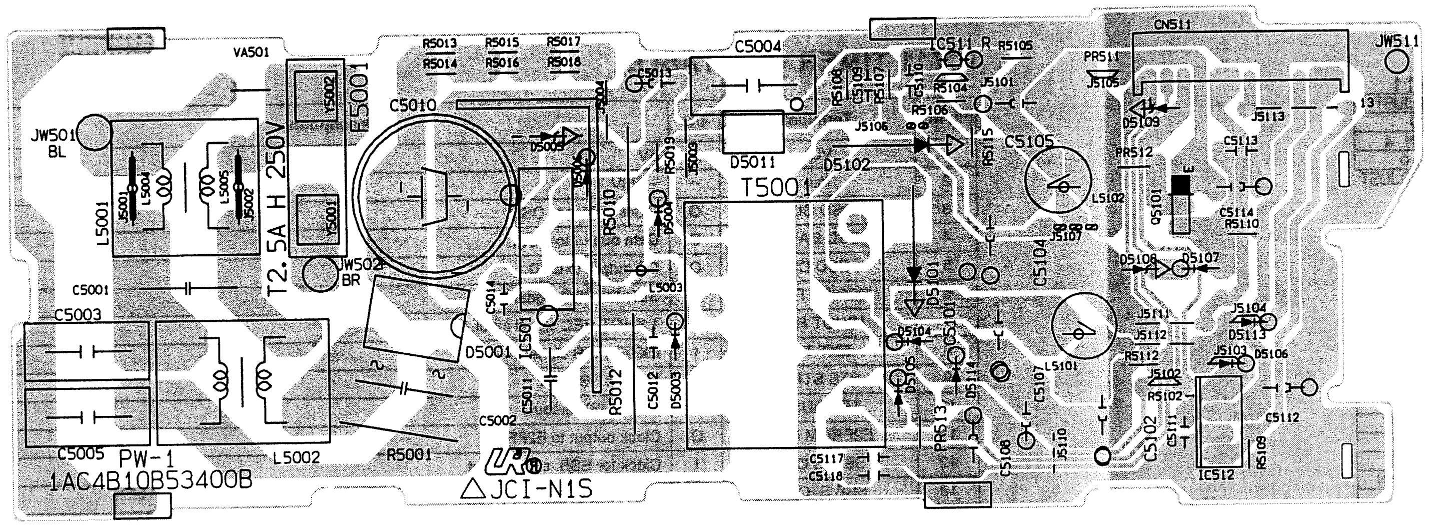

TM-1
T1_80090/EE49_EX
NOT SPECIFIED DIODE --- GMA01 or 1SS133 or WG713 or WG713A
NOT SPECIFIED LED --- PR5505S
TP711
1 CLK ADJUST
2 GND
3 KEY IN 4
4 SEG. g
CLOCK ADJUST
CN711
1 FL HEATER -
2 FL HEATER +
3 GND
4 ALWAYS 5V
5 BACK UP C.
6 ALWAYS -24V
7 SSB CLK
8 SSB DATA
9 ALARM OUT
10 ALARM IN
11 SY RESET
12 POWER DOWN
13 NC
TO SV-A
CN712
1 OSD CLK
2 OSD DATA
3 OSD CS
4 PICTURE
5 GND
TO VD-A
IC711
M38112M4-162SP
TIMER MPU
(5V) VCC
(-30V) VEE
(OSD CLK) P67
(OSD DATA) P66/AN
(OSD CS) P65
(SERIES REC) P64
(1SHOT REC) P63
(EXT TM) P62
(RTS STRB) P61
(TRS BUSY) P60/PWM
(I2C CLK) P57/SRDY2
(SSB S. CLK) P56/SCLK2
(SSB S. OUT) P55/SOUT2
(SSB S. IN) P54/SIN2
(I2C DATA) P53/SRDY1
(RTS CLK) P52/SCLK1
(TRS DATA) P51/SOUT1
(RTS DATA) P50/SIN1
(BUZZER/ADJUST) P47/TOUT
(REPEAT LED) P46
(ALARM OUT) P45/CNTR
(ALARM RESET) P44
(ALARN IN) P43
(EXT ADJ OUT) P42/INT2
(POWER DOWN) P41/INT1
(EXT ADJ IN) P40/INTO
RESET
XCIN
XCONT
XIN
XOUT
(GND) VSS
SSB DATA
32.768KHZ (HALT)
4MHZ
P30(a)
P31(b)
P32(c)
P33(d)
P34(e)
P35(f)
P36(g)
P37(h)
P00(i)
P01(j)
P02(k)
P03(l)
P04(m)
P05(n)
P06(o)
P07(p)
P10(G1)
P11(G2)
P12(G3)
P13(G4)
P14(G5)
P15(G6)
P16(G7)
P17(G8)
P20(G9)
P21(ORC LED)
P22(OSD MASK ON)
P23(B.B.ON)
P24 (KEY IN 1)
P25 (KEY IN 2)
P26 (KEY IN 3)
P27 (KEY IN 4)
1K
5.0
23.0
3.3
2.2
1.4
4.9
4.8
4.3
4.3
4.9
4.9
5.0
0
R7121 10K
R7122 10K
C7107 0.01
C7104 0.01
R7106 1K
R7103 1K
R7105 1K
R7101 10M
R7102 330K
R7104 680
C7103 18P
C7102 10P
C7101 10P
X7102 1AV4V10B0570N or 1AV4V10B0560N
X7101 1AV4V11B0170J or 1AC4V11A03400
ALL CLEAR
S7128
C7106 0.01
C7105 22/6.3
RESET
OUT
VDD
VSS
IC712
MN1381-H
REPEAT D7131
R7123 270
Q7101 DTC144EL
J7196 5e
R7124 1.5K
R7125 1.5K
VR711 1KB
PICTURE SOFT - SHARP
C7108 0.01
E2PROM
IC714
Vcc
TEST
SCL
SDA
A0
A1
A2
Vss
X24C02P-C7189 or XL24C02P or AT24C02-10P or 24LC02B/P
VOLTAGE：STOP MODE

IC711 TIMER CPU TABLE

Pin No.	Terminal	I/O	Description	H/L
1	Vcc	–	5V	–
2	Vee	–	– 23V	–
3	OSD CLK	O	Clock output to OSD.	–
4	OSD DATA	O	Data output to OSD.	–
5	OSD CS	O	CS output to OSD.	L
6	SERIES REC	I	SERIES REC signal input.	H
7	1SHOT REC	I	1 SHOT REC signal input.	H
8	EXT TM	I	EXT TIMER signal input	H
9	RTS STRB	I	RTS STRB input.	–
10	TRS BUSY	O	TRB BUSY output.	–
11	E2PROM CLK	O	Clock output to E2PROM	–
12	SSB. S CLK	I	Clock for SSB. signal input.	–
13	SSB S. OUT	O	SSB Data output.	–
14	SSB S. IN	I	SSB Data input.	–
15	E2PROM SDA	I/O	Data I/O to E2PROM.	–
16	RTS CLK	I	RTS clock signal input.	–
17	TRS DATA	O	TRS DATA signal output.	–
18	RTS DATA	I	RTS DATA signal input.	–
19	BUZZER	O	BUZZER signal input.	–
20	REPEAT LED	O	REPEAT mode indication signal.	H
21	ALARM OUT	O	ALARM signal output.	L
22	ALARM RESET	I	ALARM RESET signal input.	H
23	ALARM IN	I	ALARM signal input	H
24	EXT ADJ OUT	O	Timer clock adjust signal output.	H
25	POWER DOWN	I	Power failure dection terminal.	L
26	EXT ADJ IN	I	Timer clock adjust signal input.	H
27	RESET	I	Initial reset signal input.	L
28	XC IN	I	32.768 MHz	–
29	XC OUT	O		
30	X IN	I	4 kHz	–
31	X OUT	O		
32	Vss		GND	–
33~36	KEY IN	I	KEY SCAN input	–
37	B. B. ON	O	Signal for Blue Back ON.	H
38	OSD MASK ON	O	Signal for OSD MASK ON.	H
39	ORC LED	O	ORC MODE indication signal.	H
40~48	1~9 GRID	O	GRID output.	–
49~64	a~p SEG	O	SEG MENT/KEY SCAN output.	–

EA4QU-TT

PW-1 P.W.B.


VA501
JW501
BL
JW502
BR
F5001
T2.5A H 250V
C5010
C5004
D5011
T5001
D5102
C5105
C5104
IC501
D5001
IC511
IC512
CN511
JW511
L5001
L5002
R5001
C5001
C5002
C5003
C5005
PW-1
1AC4B10B53400B
△JCI-N1S

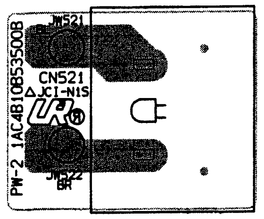
Power supply cable connection.

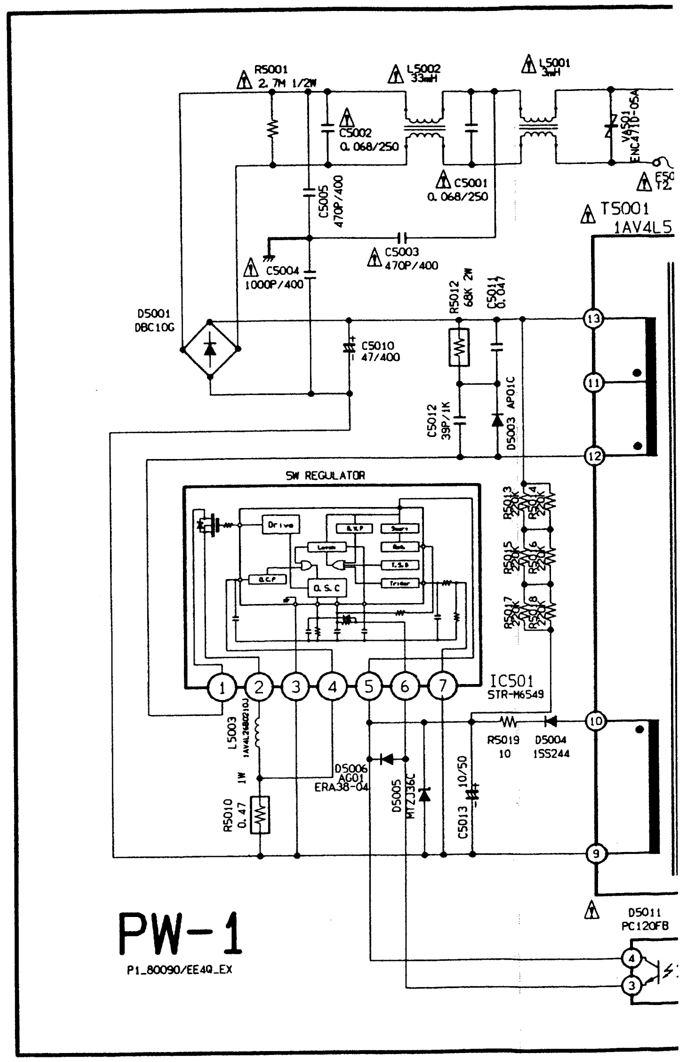
MARK : Black with characters plinted.

LIDGE : Black without characters.

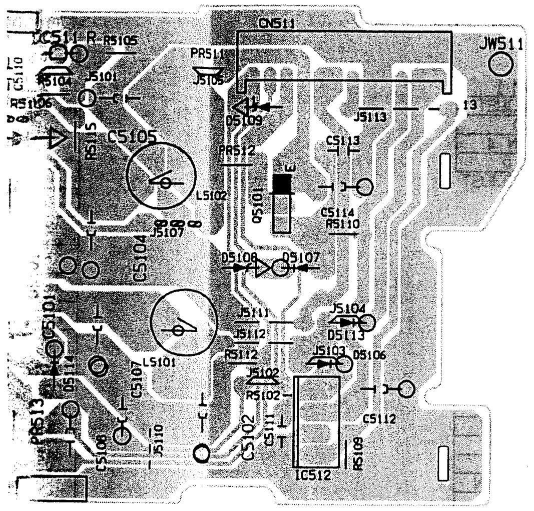
GRAND : Green.

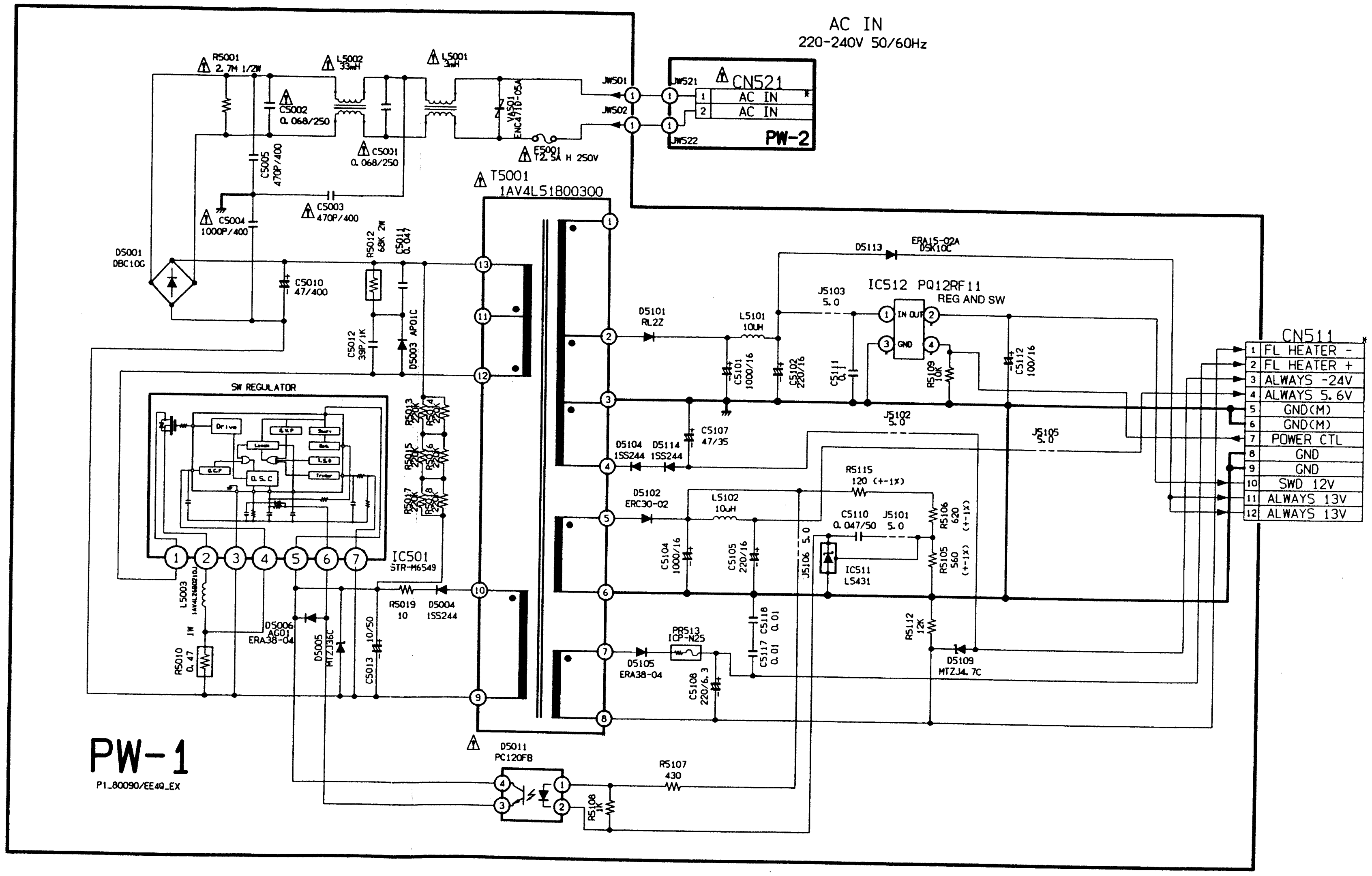
PW-2 P.W.B.


JW521
CN521
△JCI-N1S
JW522
BR
PW-2 1AC4B10B53500B


R5001
2.7M 1/2W
L5002
33mH
L5001
3mH
C5002
0.068/250
C5001
0.068/250
C5005
470P/400
C5004
1000P/400
C5003
470P/400
T5001
1AV4L5
D5001
DBC10G
C5010
47/400
R5012
68K 2W
C5011
0.047
C5012
39P/1K
D5003
AP01C
SW REGULATOR
Drive
O.S.C
IC501
STR-M6549
R5013
R5015
R5017
L5003
R5010
0.47 1W
D5006
AG01
ERA38-04
D5005
MTZJ36C
C5013
10/50
R5019
10
D5004
1SS244
D5011
PC120FB
PW-1
P1_80090/EE4Q_EX

PW-1, 2 POWER SUPPLY


CN511
JW511
PR511
PR512
C5105
L5102
Q5101
C5113
J5113
C5114
R5110
D5108
D5107
J5111
J5112
R5112
J5104
D5113
J5103
D5106
L5101
J5102
R5102
C5102
C5111
C5112
IC512
R5109
J5110
C5104
C5107
PR513
J5101
R5105
R5104
R5106
D5109
C5110
C5101


AC IN
220-240V 50/60Hz
CN521
1 AC IN
2 AC IN
JW521
JW522
PW-2
JW501
JW502
R5001 2.7M 1/2W
L5002 33mH
L5001 3mH
C5002 0.068/250
C5001 0.068/250
VA501
F5001 T2.5A H 250V
C5005 470P/400
C5003 470P/400
C5004 1000P/400
D5001 D8C10G
C5010 47/400
R5012 68K 2W
C5011 0.047
C5012 39P/1K
D5003 AP01C
T5001
1AV4L51B00300
SW REGULATOR
IC501 STR-M6549
L5003
R5010 0.47 1W
D5006 AG01 ERA38-04
D5005 MTZJ36C
C5013 10/50
R5019 10
D5004 1SS244
D5011 PC120F8
R5107 430
R5108 1K
D5113 ERA15-02A DSK10C
IC512 PQ12RF11 REG AND SW
J5103 5.0
D5101 RL2Z
L5101 10UH
C5101 1000/16
C5102 220/16
C5111 0.1
R5109 1K
C5112 100/16
D5104 1SS244
D5114 1SS244
C5107 47/35
J5102 5.0
J5105 5.0
R5115 120 (+-1%)
D5102 ERC30-02
L5102 10uH
C5110 0.047/50
J5101 5.0
R5106 620 (+-1%)
R5105 560 (+-1%)
C5104 1000/16
C5105 220/16
J5106 5.0
IC511 LS431
PR513 ICP-N25
D5105 ERA38-04
C5118 0.01
C5117 0.01
C5108 220/6.3
R5112 12K
D5109 MTZJ4.7C
CN511
1 FL HEATER -
2 FL HEATER +
3 ALWAYS -24V
4 ALWAYS 5.6V
5 GND(M)
6 GND(M)
7 POWER CTL
8 GND
9 GND
10 SWD 12V
11 ALWAYS 13V
12 ALWAYS 13V
PW-1
P1_80090/EE40_EX

SANYO

Notice

☐ CORRECTION ● PRODUCTION CHANGE

☐ SERVICE FLASH ☐ ADD INFORMATION

☐ ☐

FILE NO.

Please add this notice to the Service Manual listed below.

Category : Time Lapse Video Cassette Recorder

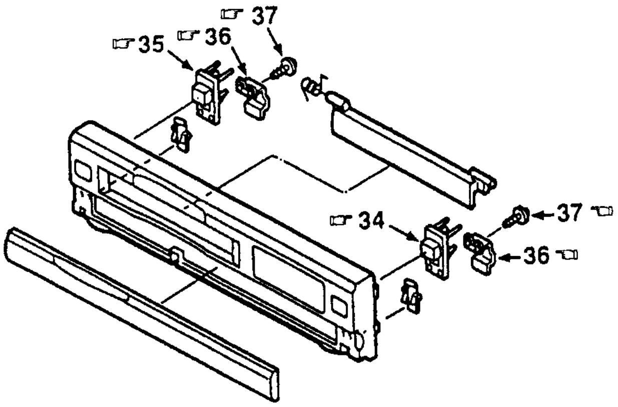
Date : 18/ Oct./ '96

Model Name	Reference No.	Destination
TLS-924P	SM 541106	General Europe

■ Reason for change

A : Misprint
B : Quality/Reliability
C : Standardization
D : Design
E : Deletion
F : Addition
G : Multiple Use

Section	Loc. No.		Part No.	Description	Interchange-ability	Reason
CABINET & CHASSIS PARTS (Page 12)	CH-34	New	613 166 7334	BUTTON, REC	—	F
	CH-35	New	613 166 7327	BUTTON, EJECT		
	CH-36	New	613 173 3237	HOLDER		
	CH-37	New	411 024 4309	SCR S-TPG PAN +FLG 2.6X8		
COMPL. PWB. VP-1 (Page 22)	VR181	Old	645 003 5685	VR, SEMI, 2.2K N	No	F
		OR	645 003 5142	VR, SEMI, 2.2K N		
		New	645 003 5722	VR, SEMI, 4.7K N	No	
		OR	645 001 8763	VR, SEMI, 4.7K N		



SANYO Electric Co., Ltd.
Osaka, Japan

V24018

SANYO

SERVICE MANUAL Time Lapse Video Cassette Recorder

TLS-2000P (EUROPE)

PRODUCT CODE No.
175 800 20 (Swiss)
175 800 21 (U.K)
175 800 22 (Australia)

Specifications

General Specifications

Recording method	Dual-azimuth dual-head rotating helical scanning system
Audio recording	Only in 3-, 12-, and 24-hour modes
Tape speed	23.39 mm/sec (3-hour mode)
Specified video cassette tape	VHS 1/2 video cassette tape
Recording/playback time	3, 12, 24, 48, 72, 96, 120, 168, 240, 480, 720, and 960 hours (when using T-180 tape) (one-shot mode is also available)
Fast-forward/rewind time	Approximately 5 minutes (when using T-180 tape)
Television system	PAL color TV system

Video

Recording method	Luminance : FM azimuth recording Chrominance : Down-converted subcarrier shift recording
Input	1V p-p, BNC, 75 Ω, unbalanced
Output	1 Vp-p, BNC, 75 Ω, unbalanced
Horizontal resolution	Black & white mode : 350 lines or more Color mode : 250 lines or more
Signal to noise ratio	46dB (3-hour mode)

Audio

Input	360 mV (− 7.8 dBs), RCA pin jack, 100kΩ, unbalanced
Output	360 mV (− 7.8 dBs), RCA pin jack, 600Ω, unbalanced
Microphone input	−60 dBs, 3.5 mm minijack, high impedance

Connectors

Alarm input	Low active
Alarm output	+ 5 V, 5.7 kΩ (Low active)
Alarm reset input	Low active
Tape end output	+ 5 V, 5.7 kΩ (Low active)
Clock output	+ 5 V, 10 kΩ (Low active)
One-shot input	Low active
Series input	Low active
Series output	+ 5 V, 10 kΩ (Low active)
Switch output	+ 5 V, 10 kΩ (Low active)
Remote control input	3.5 mm minijack
Audio sensor output	Low active

Other Specifications

Operating temperature range	5 °C to 40 °C
Operating humidity range	80 % or less
Power supply	Continental Europe : 220-230VAC, 50 Hz UK or Australia : 240VAC, 50Hz
Power consumption	18 W (approx.)
Weight	5.8 kg
Dimensions	420 (W) × 100 (H) × 340 (D) mm
Accessory	AC power cord

Because its products are subject to continuous improvement, SANYO reserves the right to modify product designs and specifications without notice and without incurring any obligation.

VP4Q-/SW,/E,/A '92 **REFERENCE NO. WM-550197**

MAINTENANCE TABLE ON THE MONITOR SCREEN

To display the maintenance table, press "PAGE" key with "▼" key while the seventh MENU <ALARM TIME> is displayed.

ALARM TIME ⟶ Press "PAGE" key with "▼" key. ⟶ Maintenance table 1

Normal screen ⟵ "PAGE" key ⟵ Maintenance table 2 ⟵ "PAGE" key

Press "CLK/CNT" key when the maintenance table is displayed, the screen will compulsorily return to the normal one.

Maintenance Table 1

The used time of each mode (part) is displayed, and can be reset by items.

Access the maintenance-screen according to the above, and then Fig. below is displayed and HEAD TIME will blink.

Move the blinking to the item to be reset with "↓" key and press the "AL/PL RESET" key. and then the used time for the item will be reset (0000H).

```
        MAINTENANCE TABLE 1
 <USED TIME>
    HEAD                    0 0 0 0 H
    POWER ON                0 0 0 0 H
    ALARM                   0 0 0 0 0
```

HEAD ………… Used time of the video head (cylinder)
Total hours of <MH-ON> (SSB BLK2 D4) = "H"
Note : Reset when the cylinder is replaced.

POWER ON … Hours of the power supply being ON <POWER ON> (SSB BLK1 D7) = "L".

ALARM ……… Number of ALARM REC.
Total counts of ALARM.
Note : The data for the maintenance tables are memoried in E²PROM, and the memory can be kept if the timer microcomputer is reset.

Maintenance Table 2

As shown in Fig. below Maintenance Table 2, <ERROR> and <REPAIR> are displayed on the screen.

```
         MAINTENANCE TABLE 2
 <ERROR>
 1   9 2 / 1 2 / 2 5   E 1
 2   - - / - - / - -   - -
 3   - - / - - / - -   - -

 <REPAIR>
 1   9 2 / 1 2 / 2 5 CYL
 2   - - / - - / - -   - - - - -
 3   - - / - - / - -   - - - - -
```

<ERROR>…… Dates and error codes are displayed when VCR happens to be in an abnormal condition and the system is down.
The newest data is displayed in the first line, and the old ones are moved down one by one. Not-displayed old data is cleared automatically.

<REPAIR> … Repair dates and comments are input here.
Set the date in the same way as clock-setting.
The comment should be 5 letters maximum.
Decide the position of letters with "→" and ↓ keys, and choose the letters to input with "+" and "−" keys. (See Fig. below)

⟶ A ⟵⟶ B ~ Y ⟵⟶ Z ⟵⟶ 1 ⟵⟶ 2 ~ 8 ⟵⟶ 9 ⟵

Error codes :

E1 ⟶ No operation of reel sensor when it should operate.
E2 ⟶ No operation of MH sensor when it should operate.
E3 ⟶ System down when tape loading.
E4 ⟶ System down when tape unloading.

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PRODUCT SAFETY NOTICE

Product safety should be considered when a component replacement is made in any area of a TIME LAPSE VIDEO CASSETTE RECORDER. Components indicated by the symbol ⚠ in the parts list and the schematic diagram designate components in which safety can be of special significance. It is particularly recommended that only parts designated on the parts list in this manual be used for component replacement designated by the symbol. No deviations from resistance, wattage or voltage ratings may be made for replacement items designated by the symbol.

1.OUTLINE

1-1. Features

FIELD RECORDING/FIELD PLAYBACK

Because single fields can be recorded one by one in time-lapse mode and all fields can be viewed separately during playback, more information is recorded.

VIDEO (AUDIO) PLAYBACK IN 12-/24-HOUR MODE

Even in 12- or 24-hour mode, this unit records audio information along with video information. This audio information can be heard by selecting audio mode during playback.

AUTOREPEAT RECORDING

By setting the repeat mode switch, recording will proceed normally until the end of the tape is reached. The unit will then rewind the tape and start recording again from the beginning of the tape.

TWO TIMER RECORDING METHODS

Timer recording can be used on a daily basis or on a weekly basis. The timer settings are made and confirmed on the monitor.

SERIES RECORDING FUNCTION

This function permits long-term continuous recording using two or more time-lapse VCRs.

ALARM RECORDING

If an externally connected alarm sensor is triggered, the unit switches to the alarm recording mode, recording speed, and recording time set on the monitor and begins to make a complete recording of the situation that triggered the alarm.

ONE-SHOT RECORDING

Recording can be done on a single-field basis.

MODE SETTINGS ON MONITOR

The mode settings for all functions, such as the recording time setting for recording using the internal timer, the alarm recording mode settings, etc., can be made on the monitor.

MULTIPLE RECORDING MODES

In addition to 3-, 12-, and 24-hour recording, all of which permit audio recording, 48-, 72-, 96-, 120-, 168-, 240-, 480-, 720-, and 960-hour recording are all possible, as well as one-shot recording.

BUILT-IN TIME-DATE GENERATOR

This unit has a built-in microprocessor equipped with a calendar function that allows you to set the internal timer, display the current time and manage other clock-related functions on the monitor and on the digital display.

DATE AND TIME RETRIEVAL FUNCTION

By using a high-performance VASS, recordings made in time-lapse mode can be searched by date and time, a type of search function that is highly valued in time-lapse VCRs.

ALARM SEARCH FUNCTION

Plays back every five seconds of an alarm recording.

FORWARD/REVERSE FIELD ADVANCE

This unit offers improved search functions with the ability to move both forwards and backwards between fields.

AUTOMATIC HEADCLEANING FUNCTION

The head is cleaned automatically each time a tape is loaded or unloaded.

CLOCK OPERATION BACKUP

In the event of a loss of power, the built-in rechargeable battery will provide backup power for the clock for up to 15 days.

Essential data, such as setting data, internal timer time settings, recording time, mode settings, and alarm recording mode settings are also retained since they are stored in nonvolatile memory.

SECURITY LOCK

This unit is equipped with a function that locks all buttons, as well as other safety functions.

AZIMUTH SELECTION FUNCTION

With this function, if a problem develops with one head, the subhead is used to regain a good video image.

RECORDING CHECK FUNCTION

This function is used to check the recorded image during recording by pressing a single button.

2. MECHANISM DESCRIPTION

2-1. OUTLINE OF MECHANISM

This mechanism is named "JOG SHUTTLE Mechanism." Its features include :

(1) Without increasing the number of motors compared to the usual mechanism (P88 & P89 mechanisms), the smooth driving of tapes and the changing of modes in accordance with the Jog Shuttle are realized. The mechanism remains to be 70.3mm in height, which is equal to the dimension of the usual mechanisms.

(2) After insertion of a cassette, the tape is normally wound to the head drum based on the full loading system. When changing the mode in playback, the pinch roller is always pressed to the capstan motor shaft ; which enables the cutting in high accuracy.

(3) In addition to the full loading system, the mode changing with little screen noise is realized by winding the tape to the back tension pole and controlling the tape tension to reduce the tape losseness to the minimum.

(4) The same mechanism as the usual model is adopted to the head drum front mechanism to improve the serviceability.

2-2-1. Quick playback

I . Mode shift time such as the STOP → PLAY and FF/REW → PLAY has been shortened for quicker playback.

II. High speed VISS, VASS
The total time from detecting the record of signal for program selecting (VISS and VASS) adopted in VHS system to appearing on the screen is shortened to make high speed VISS and VASS possible.

(1) Features of full loading mechanism
With the provision of the full loading mechanism, the operating convenience, which was hitherto a drawback of the VHS system, has been improved. In addition, it has several features as follows ;

III. F/R search
FF → F. SEARCH and REW →R. SEARCH can be made directly by reducing the mode transition time.

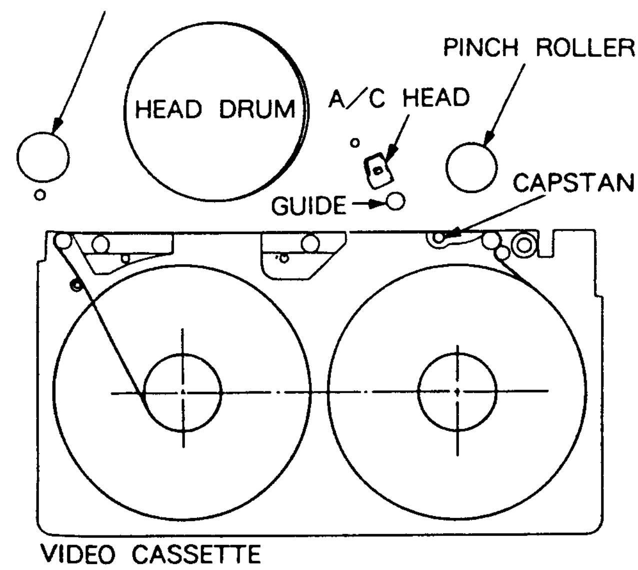

IMPEDANCE ROLLER
HEAD DRUM
A/C HEAD
PINCH ROLLER
GUIDE
CAPSTAN
VIDEO CASSETTE

Fig. 2-1-1. ⓐ **Conventional VHS Tape Loading System (At FF/REW Mode)**

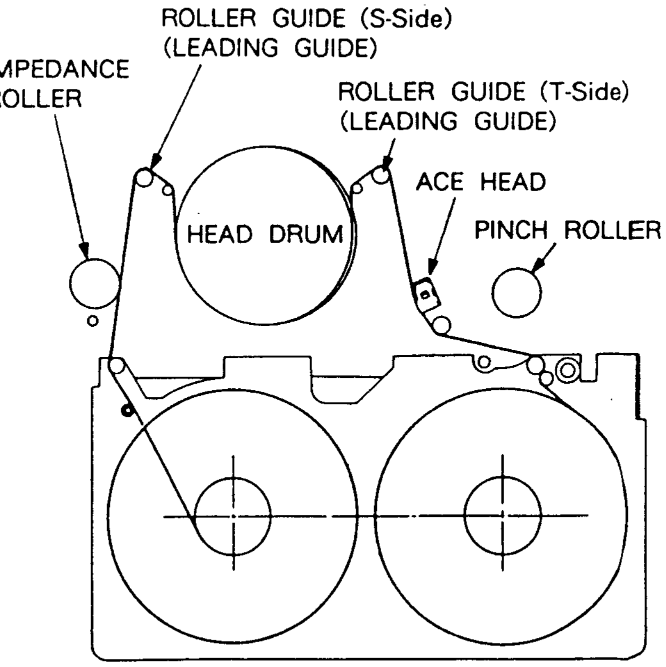

ROLLER GUIDE (S-Side)
(LEADING GUIDE)
IMPEDANCE ROLLER
ROLLER GUIDE (T-Side)
(LEADING GUIDE)
ACE HEAD
HEAD DRUM
PINCH ROLLER

Fig. 2-1-1. ⓑ **New Full Loading System (At FF/REW Mode)**

(5) Video Tape Protection Mechanism

(a) FF/REW→STOP

Tape tension applied to the head drum when stopping is lowered by optimizing the balance between the left and right, and brake forces acting on the left and right reel table. Thereby it prevents from causing a scratch on the tape due to V-head when stopping.

(b) STOP→FF/REW

The starting-up speed of the capstan motor is ingeniously designed to preclude the possibility of unusual tape tension at the time of REW/FWD start-up.

(c) Tape end brake damping

The design of the mechanism is so made that the time from issuance of an electrical STOP command till actual brake application is reduced to a minimum. This enables the braking to be completed before the leader tape end.

(d) FF/REW running

To ensure highly stable tape running in any condition and any environment, design consideration is given to the foundation brake torque (soft brake) to the reel table and the tape winding angle with respect to each tape guide. Particularly in regard to the supply side fixing guide and F.T.E (Full Track Erase) head, the design is so made that they do not come into contact with the tape at the time of FF/REW operation to alleviate load application.

(6) Final End Position Tape Loading Protection Mechanism

Tape pull-out (loading) from within the cassette is done to ensure proper take-up of the tape onto the head drum. At that time, the tape is extended from the supply reel side.

So, if the tape is wound to the final end, no loading can be made. For this reason, a mode is designed to allow the tape to be rewound a little at the final end of the tape without any loading done.

(7) Video Tape Protection Mechanism for Special Playback

This machanism is only provided with VTRs having editing function by JOG SHUTTLE function. In order to prevent tapes from being damaged in case of switching modes or performing special playback with the JOG SHUTTLE button, the following protection mechanism has been developed.

I. Leaving VTRs in STILL Mode

VTRs with JOG SHUTTLE function can be changed to STILL mode operation normally by pressing the STILL button. However, they can also be changed to STILL mode operation (JOG SHUTTLE ready mode) by pressing the JOG SHUTTLE button. Besides, they also go to STILL mode operation after operating the JOG SHUTTLE button. Leaving VTRs in this STILL condition for over 5 minutes, they automatically are changed to STOP mode.

II. Time Limit For SLOW, R/SLOW, R/PLAY operation

After performing F/ADV, R-F/ADV, SLOW, R/SLOW, R/PLAY operation continuously for over 5 minutes, VTRs are changed to STOP mode automatically.

III. Detecting Time Required for System-Down by Supply Side Reel Sensor

SLOW, R/SLOW : 10 seconds
REC, PLAY, R/PLAY and so on : 2.5 seconds
F/SEARCH, R/SEARCH, FF, REW : 1 second

Protection mechanism conventionally provided mainly for tape running in FWD direction also functions in case of R/PLAY. In such a way, tape protection for all modes are available.

2–2. DESCRIPTION OF MECHANISM OPERATION

2-2-1. BASIC OPERATION MODE OF MECHANISM

With JOG SHUTTLE mechanism, the following modes shown in the table below (Fig. 2-2-1) uniquely provided with the mechanism are available in addition to the operation modes normally provided with the VTR (such as STOP, FF, REW, PLAY, R/PLAY, REC, R-SEARCH, F-SEARCH, STILL, SLOW, F/ADV, R-F/ADV). The modes uniquely provided with the mechanism function when switching operation modes of the VTR. These modes are very important to protect video tape from being damaged. Changing modes of the mechanism is made according to the control signal of the system control circuit to control rotation of the loading motor. Detaction of the mechanism operation mode position which is important to this control is performed by the FL START SWITCH to detect EJECT/LOAD of the cassette and the MECHANISM MODE SWITCH to detect each mode of the mechanism (outputs Mode Data of 3 bit using the ROTARY SWITCH).

Mechanism Mode	Mechanism Mode Switch 2	1	0	HEX DATA	Function	Main Mode Shifting Conditions	VTR Operation Mode
EJECT	–	–	–		Eject position		EJECT
					↑ Front loading/Unloading ↓		
SHORT REW	–	–	–		Take up operation in the tape end position		Detected by FL END switch
INITIAL	1	1	1	⑦	Power off position		Power off when tape is loaded completely
					Tape unloading position ↑ Tape loading ↓ Tape loading ending position		
BRAKE	0	0	1	①	Main brake applying position		
STOP/FF/REW	0	1	0	②	STOP waiting and FF/REW (the head motor rotation)		STOP, FF/REW
PLAY	0	1	1	③	From FWD direction Normal running mode		PLAY,REC, F-SEARCH
STILL SLOW	1	0	0	④	The positions of STILL, SLOW or F-ADV.		STILL, SLOW, F-ADV
R. SLOW	1	0	1	⑤	R. SLOW, R. F. ADV		STILL R.SLOW R.F.ADV
REV	1	1	0	⑥	From REV direction Normal running mode		R-SEARCH R-PLAY

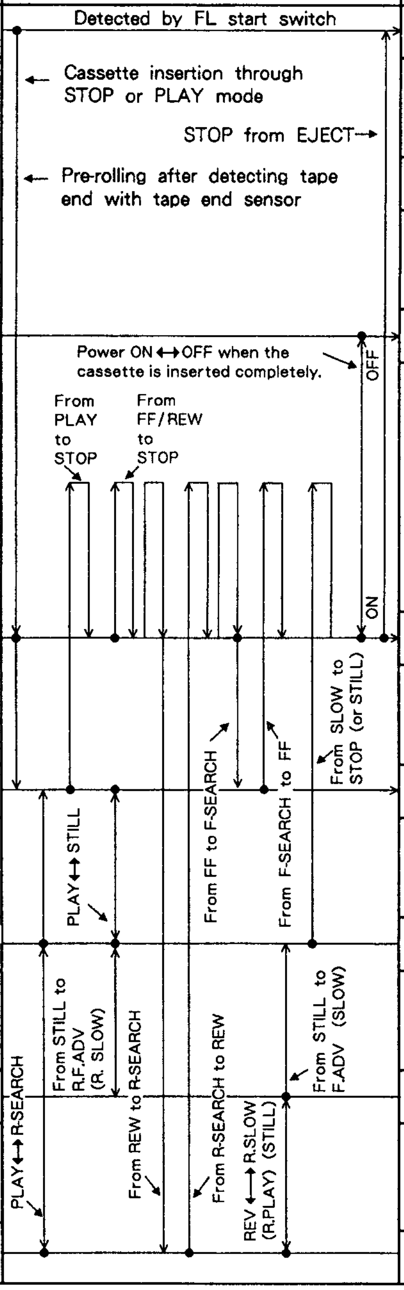

Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor
Power ON↔OFF when the cassette is inserted completely.
OFF
ON
From PLAY to STOP
From FF/REW to STOP
From SLOW to STOP (or STILL)
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔STILL
From STILL to R.F.ADV (R. SLOW)
From REW to R-SEARCH
From R-SEARCH to REW
From STILL to F.ADV (SLOW)
PLAY↔R-SEARCH
REV↔R.SLOW (R.PLAY) (STILL)

Table. 2-2-1.

2-2-2. DESCRIPTION OF MECHANISM DRIVE

To realize the thin type mechanism, a loading motor and two pieces of cam (MAIN CAM GEAR and the MODE CAM GEAR) to be driven by the said motor are mounted on the upper part of the capstan motor, that was a dead space in the conventional mechanisms hitherto available, with a view to optimization of parts mounting layout. (Fig.2-2-1. and Fig.2-2-2.)

In this mechanism, to realize smooth mode change and tape driving according to the operation of the JOG SHUTTLE button, ONE-WAY CLUTCH and its locking mechanism are also provided with the reel driving section.

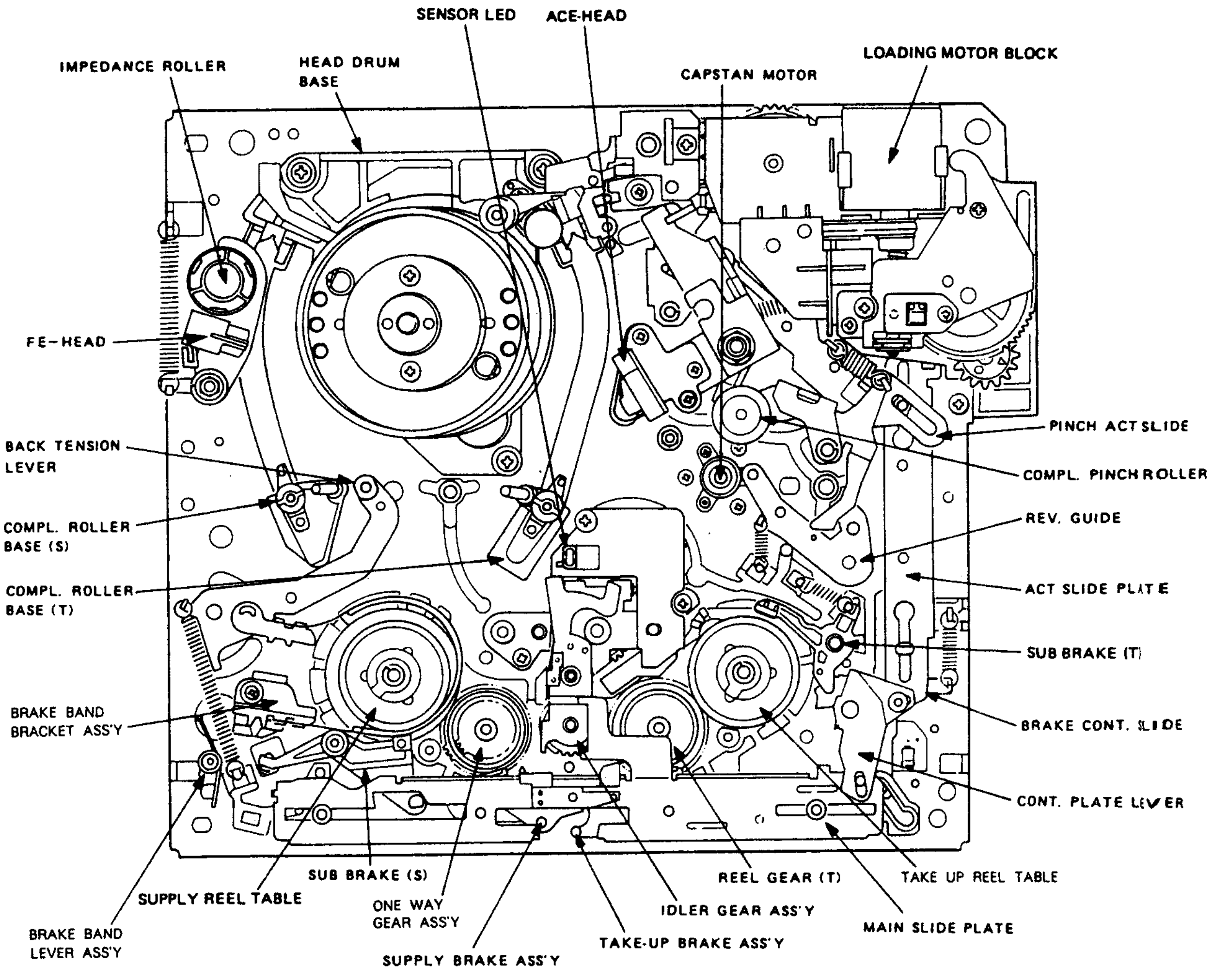

SENSOR LED
ACE-HEAD
IMPEDANCE ROLLER
HEAD DRUM BASE
CAPSTAN MOTOR
LOADING MOTOR BLOCK
FE-HEAD
BACK TENSION LEVER
COMPL. ROLLER BASE (S)
COMPL. ROLLER BASE (T)
BRAKE BAND BRACKET ASS'Y
PINCH ACT SLIDE
COMPL. PINCH ROLLER
REV. GUIDE
ACT SLIDE PLATE
SUB BRAKE (T)
BRAKE CONT. SLIDE
CONT. PLATE LEVER
SUB BRAKE (S)
SUPPLY REEL TABLE
ONE WAY GEAR ASS'Y
BRAKE BAND LEVER ASS'Y
SUPPLY BRAKE ASS'Y
REEL GEAR (T)
IDLER GEAR ASS'Y
TAKE-UP BRAKE ASS'Y
TAKE UP REEL TABLE
MAIN SLIDE PLATE

Fig.2-2-1. Top View of Mechanism (Initial mode)

Note: Some models have no Capstan Soft Brake.

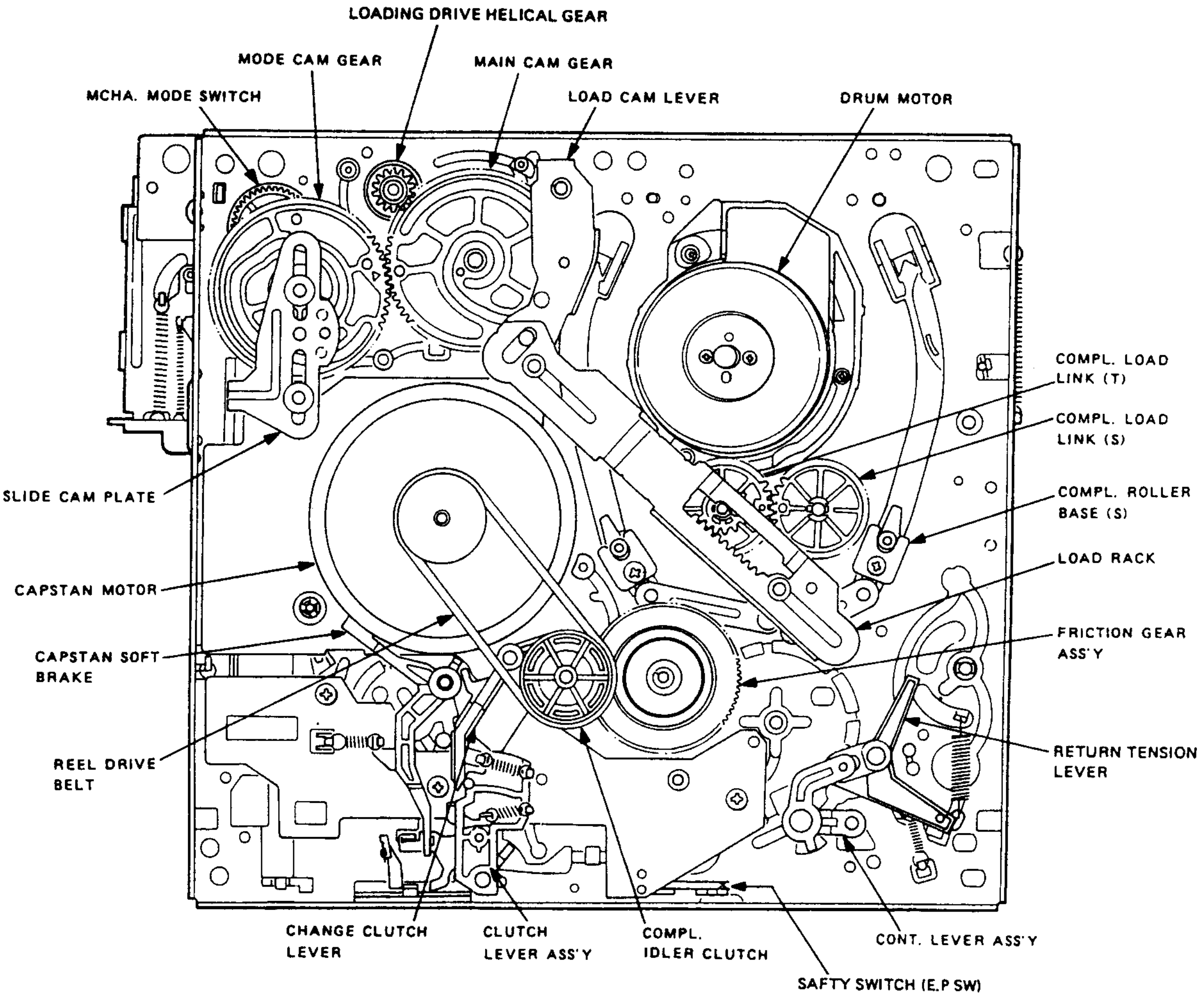

LOADING DRIVE HELICAL GEAR
MODE CAM GEAR
MAIN CAM GEAR
MCHA. MODE SWITCH
LOAD CAM LEVER
DRUM MOTOR
COMPL. LOAD LINK (T)
COMPL. LOAD LINK (S)
COMPL. ROLLER BASE (S)
SLIDE CAM PLATE
LOAD RACK
CAPSTAN MOTOR
FRICTION GEAR ASS'Y
CAPSTAN SOFT BRAKE
REEL DRIVE BELT
RETURN TENSION LEVER
CHANGE CLUTCH LEVER
CLUTCH LEVER ASS'Y
COMPL. IDLER CLUTCH
CONT. LEVER ASS'Y
SAFTY SWITCH (E.P SW)

Fig.2-2-2. **Bottom View of Mechanism (Initial mode)**

These two cams have one CAM GROOVE on both sides. A total of four CAM GROOVEs performs independent functions to meet the multi-function needs of these days by driving the elements of a wide variety of functions with the motor precisely controlled by a microcomputer.

The two cams are positive motion cams having a groove over 570 degrees. These cams cause the amount of lift to be changed by a mild gradient according to the angle of rotation while synchronizedly being rotated by an outer circumferential gear to alleviate the load exerted on the cams when driving the rod linked with the cams and also to ensure position stability in each mode of operation. The geometry of each cam and that of a metal fitting of the drive section are shown in Fig. 2-2-3 and Fig. 2-2-4, respectively. Also, the role of each cam used is described below.

On the GROOVE 3 side of MODE CAM GEAR have a small gear. This small gear is engaged with the MECHANISM MODE SWITCH as shown in Fig. 2-2-3., and detect the mechanism operation mode. In this way, the two cams and the MECHANISM MODE SWITCH are rotated synchronously, and the mechanism is fully synchronized and driven for each mode.

MAIN CAM GEAR :	CAM GROOVE 1. Pinch roller pressing operation CAM GROOVE 2. Tape loading mechanical drive
MODE CAM GEAR :	CAM GROOVE 3. Brake and clutch selecting operation CAM GROOVE 4. Brake control and front unloading control

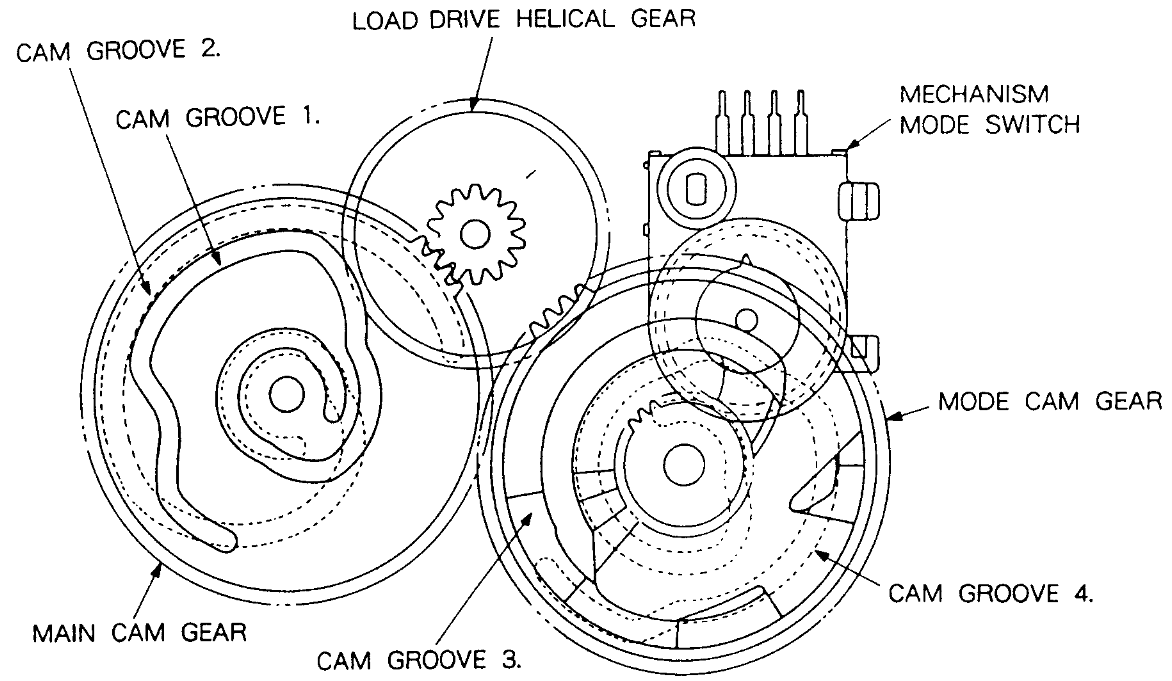


Fig.2-2-3. **Plan of Cams Construction**

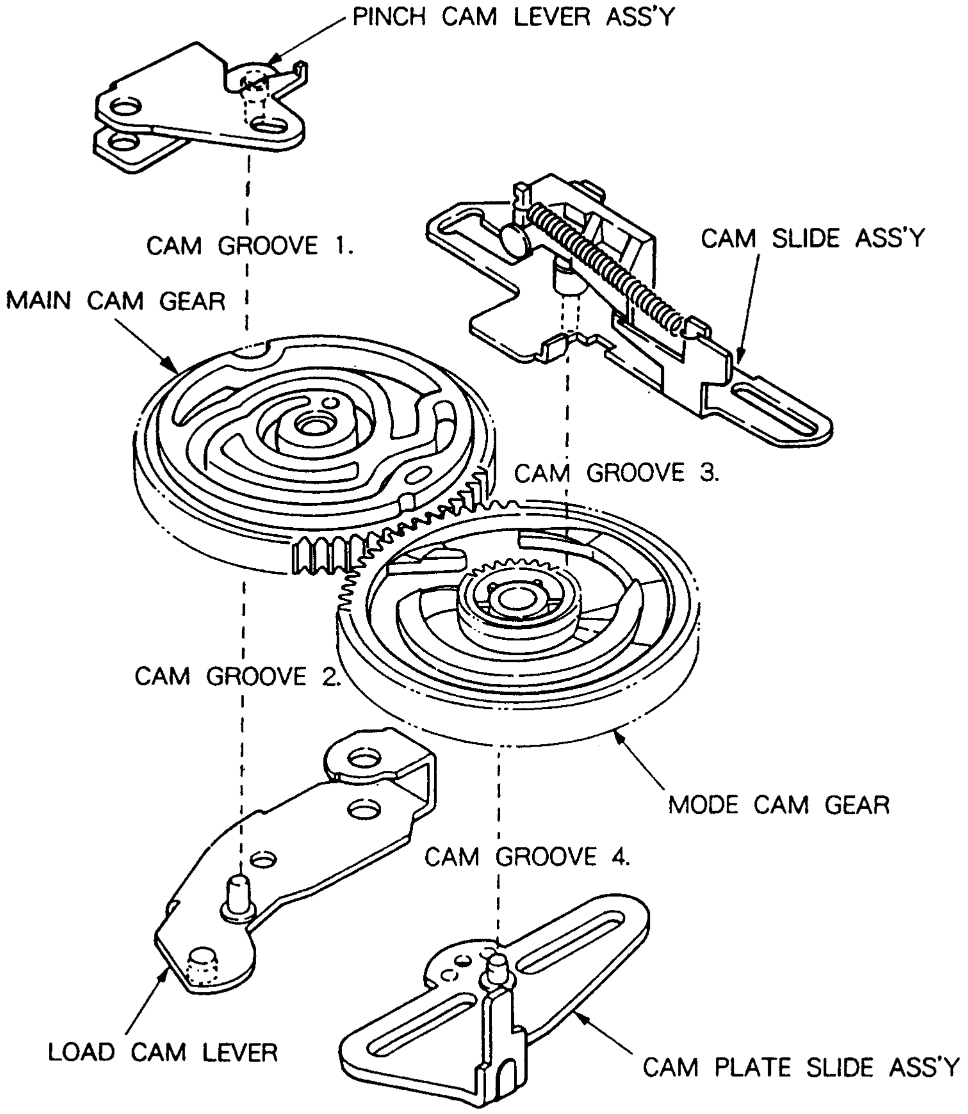

PINCH CAM LEVER ASS'Y
CAM SLIDE ASS'Y
CAM GROOVE 1.
MAIN CAM GEAR
CAM GROOVE 3.
CAM GROOVE 2.
MODE CAM GEAR
CAM GROOVE 4.
LOAD CAM LEVER
CAM PLATE SLIDE ASS'Y

Fig.2-2-4. View of Cams Construction

(1) Tape Loading Mechanism

The tape loading mechanism is compactly designed with use of a LOAD RACK for loading by drive from the before-mentioned MAIN CAMs with CAM GROOVE 2. The LOAD RACK is laid on the dead space in between the DD capstan motor and the head motor for effective space utilization. (Fig.2-2-5) The process from tape pull-out upon loading to contact of the leading guide section with the stopper of drum base and press-fitting under tension of spring is guided and driven in such a manner that the rod is drawn inward from the outer circumferential direction of the CAM GROOVE 2, thereby reducing the load torque (PV value) to the CAM GROOVE. And, the load of the loading motor is minimized to enhance reliability.

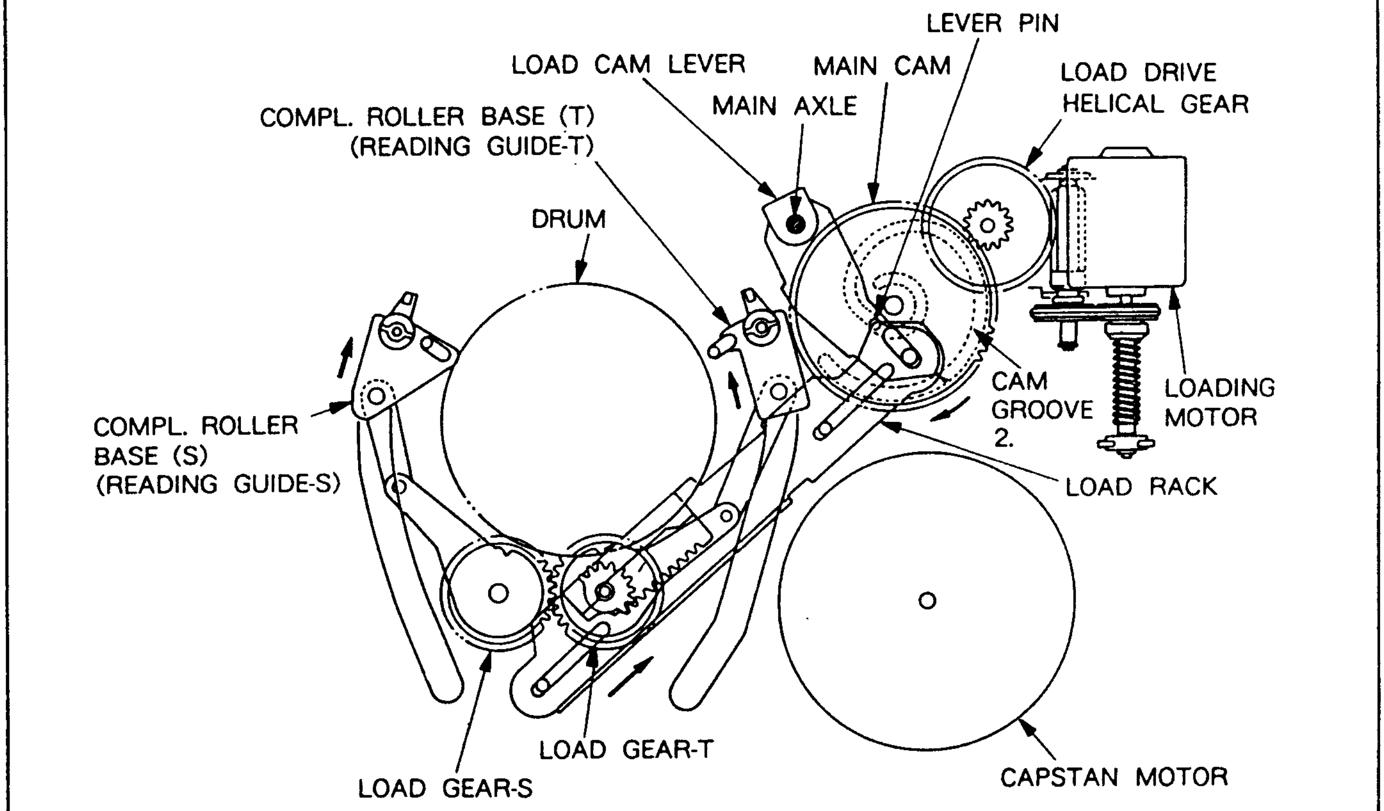

LEVER PIN
LOAD CAM LEVER
MAIN CAM
LOAD DRIVE HELICAL GEAR
MAIN AXLE
COMPL. ROLLER BASE (T) (READING GUIDE-T)
DRUM
COMPL. ROLLER BASE (S) (READING GUIDE-S)
CAM GROOVE 2.
LOADING MOTOR
LOAD RACK
LOAD GEAR-T
LOAD GEAR-S
CAPSTAN MOTOR

Fig.2-2-5. Construction of Tape Loading Mechanism

(2) Pinch Roller Pressing Mechanism

The PINCH LEVER assembly of the pinch roller is operated by the PINCH CAM LEVER (rod) driven by the CAM GROOVE 1 of the before-mentioned MAIN CAM, and then press-fitted to the capstan. The revolving tape guide (REV.GUIDE) is interlockingly operated with the PINCH LEVER assembly to ensure stable tape running at a fixed speed. (Fig.2-2-6)

In addition, the pinch roller is always press-fitted to the capstan even when changing modes to improve accuracy of the editing function and to enable the modes to be changed smoothly.

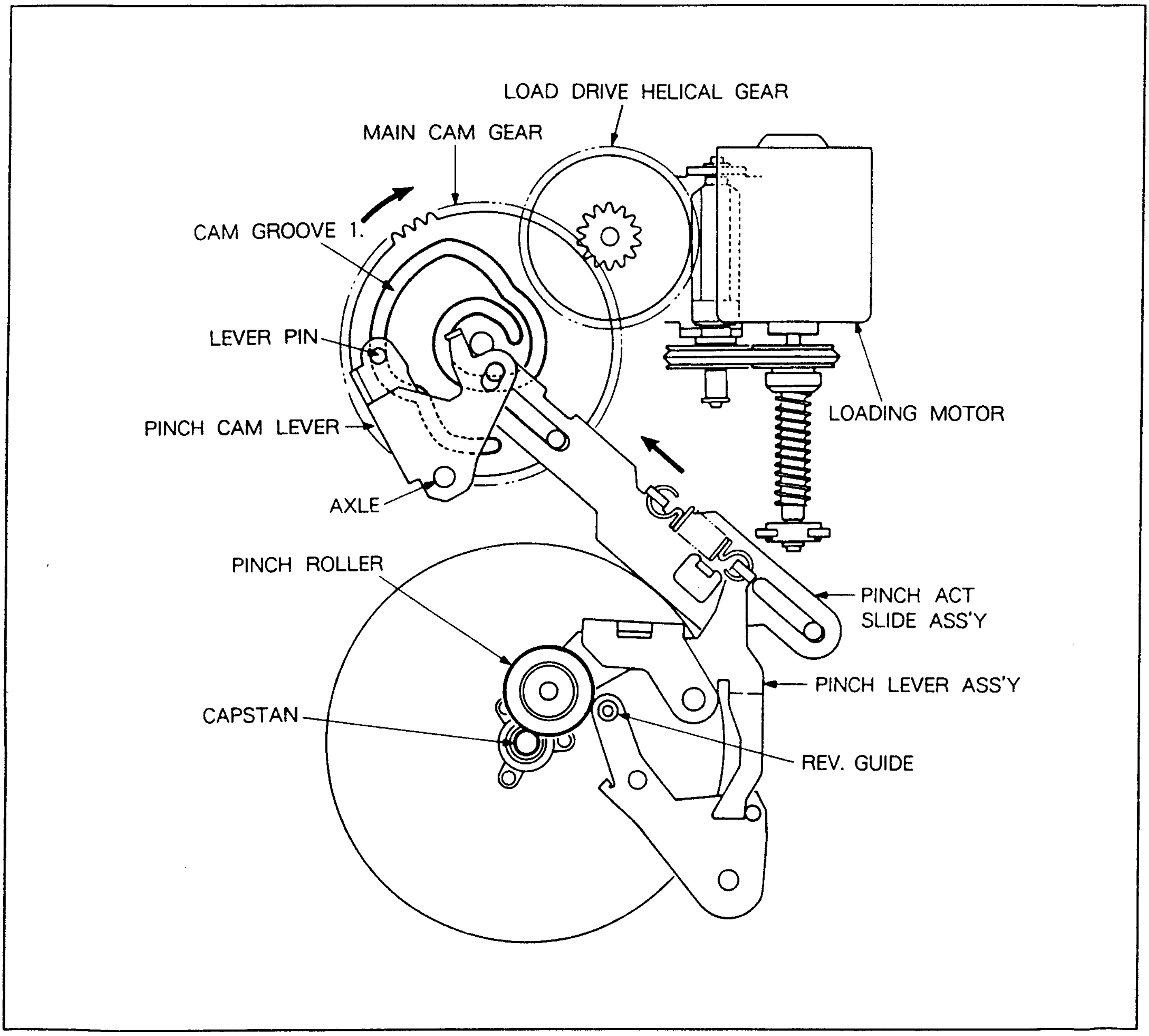

LOAD DRIVE HELICAL GEAR
MAIN CAM GEAR
CAM GROOVE 1
LEVER PIN
PINCH CAM LEVER
AXLE
PINCH ROLLER
CAPSTAN
LOADING MOTOR
PINCH ACT SLIDE ASS'Y
PINCH LEVER ASS'Y
REV. GUIDE

Fig.2-2-6. **Construction of Pinch Roller Mechanism**

(3) Operation of Brake Control Plate

The ACT SLIDE PLATE and the MAIN SLIDE PLATE shown in Fig.2-2-7 are driven by the CAM GROOVE 4 of the MODE CAM GEAR for precise control of operations including the control of back tension lever, auxiliary brake (SUB BRAKE S/T), main brake (SUPPLY BRAKE and TAKE-UP BRAKE), clutch selection, and drive selection of front loading mechanism.

Also, the mechanism mode switch is engaged with the small gear of the MODE CAM GEAR for synchronous rotation. At this time, the position of the mode detection is set to the flat portion of the CAM GROOVE 4 on the MODE CAM GEAR. Therefore, even if the motor stop timing (after detecting the loading motor stop position) is deviated due to the load, the control plate linked with the cam stops at the specified position.

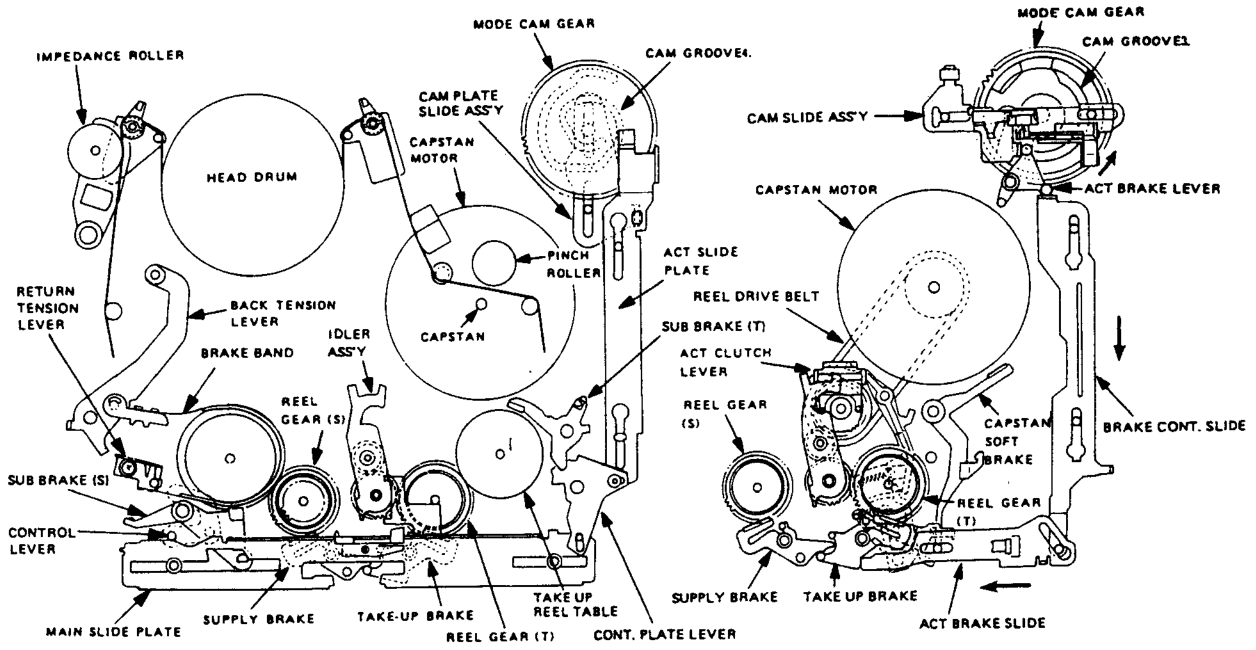

MODE CAM GEAR
IMPEDANCE ROLLER
CAM GROOVE4.
CAM PLATE SLIDE ASS'Y
CAPSTAN MOTOR
HEAD DRUM
PINCH ROLLER
ACT SLIDE PLATE
RETURN TENSION LEVER
BACK TENSION LEVER
IDLER ASS'Y
CAPSTAN
BRAKE BAND
REEL GEAR (S)
SUB BRAKE (S)
CONTROL LEVER
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE UP REEL TABLE
REEL GEAR (T)
CONT. PLATE LEVER
MODE CAM GEAR
CAM GROOVE4.
CAM SLIDE ASS'Y
ACT BRAKE LEVER
CAPSTAN MOTOR
REEL DRIVE BELT
SUB BRAKE (T)
ACT CLUTCH LEVER
REEL GEAR (S)
CAPSTAN SOFT BRAKE
BRAKE CONT. SLIDE
REEL GEAR (T)
SUPPLY BRAKE
TAKE UP BRAKE
ACT BRAKE SLIDE

Fig. 2-2-7. Construction of Brake Control Plate (At REW/FF, STOP Mode)

(4) Brake Control Mechanism

The mechanical logic of the brake state is shown in Fig.2-2-8 ⓐ, ⓑ. The brake which damps the reel rotation is operated by the BRAKE CONTROL SLIDE driven from the CAM GROOVE 3 of the MODE CAM GEAR.

Also, to alleviate damage to the tape caused by high tension of the brake in operation, the shape of the left and right brakes is thoughtfully designed for proper biting-in ratio.
This enables the supply brake to be released by the operation of the MAIN SLIDE PLATE after an elapse of prefixed slight time to reduce the tape tension to zero, and to provide the tape with a proper degree of looseness. As a result, there is a slight gap between the tape and the HEAD DRUM. Further, a momentary still mechanism which dispenses with use of a plunger solenoid is not provided as one of design features of the JOG mechanism.

To stabilize the image in an extremely short period of time during a shift to the STILL mode from the PLAY mode, the auxiliary brake (CAPSTAN SOFT BRAKE) is press-fit to the outer circumference of the capstan motor by the before-mentioned CAM GROOVE 3 of the MODE CAM GEAR.
These operations are interlocked with the operation of the before-mentioned ACT SLIDE PLATE and the MAIN SLIDE PLATE. The operations are controlled by one single cam (MODE CAM), so the operating position is adequately fixed.

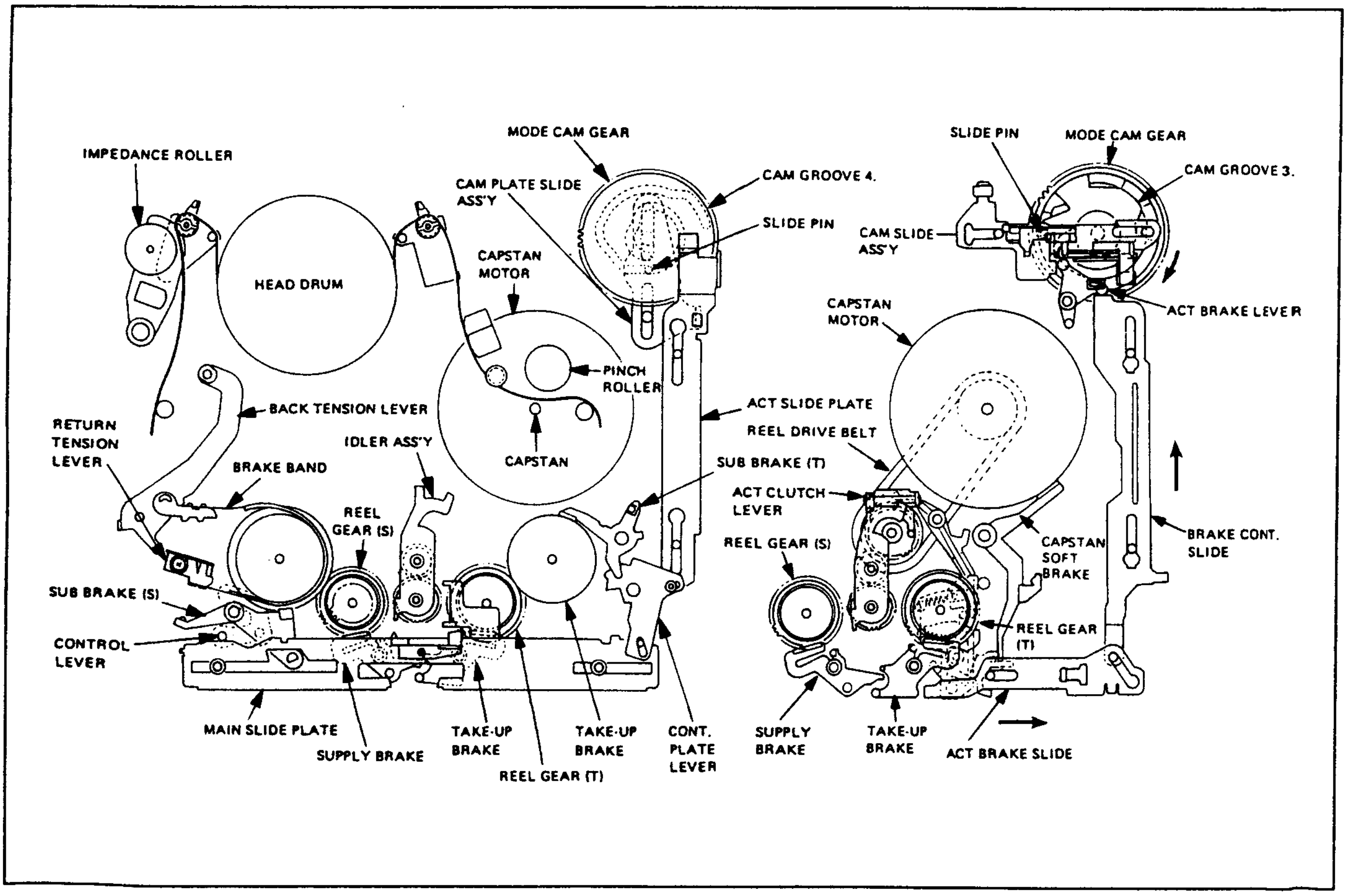

MODE CAM GEAR
IMPEDANCE ROLLER
CAM PLATE SLIDE ASS'Y
CAPSTAN MOTOR
HEAD DRUM
PINCH ROLLER
BACK TENSION LEVER
RETURN TENSION LEVER
IDLER ASS'Y
CAPSTAN
BRAKE BAND
REEL GEAR (S)
SUB BRAKE (S)
CONTROL LEVER
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE-UP BRAKE
REEL GEAR (T)
CONT. PLATE LEVER
CAM GROOVE 4.
SLIDE PIN
ACT SLIDE PLATE
REEL DRIVE BELT
SUB BRAKE (T)
ACT CLUTCH LEVER
REEL GEAR (S)
SLIDE PIN
MODE CAM GEAR
CAM GROOVE 3.
CAM SLIDE ASS'Y
CAPSTAN MOTOR
ACT BRAKE LEVER
CAPSTAN SOFT BRAKE
BRAKE CONT. SLIDE
REEL GEAR (T)
SUPPLY BRAKE
TAKE-UP BRAKE
ACT BRAKE SLIDE

Fig.2-2-8. ⓐ **Construction of Brake Control Plate (At Brake Mode)**

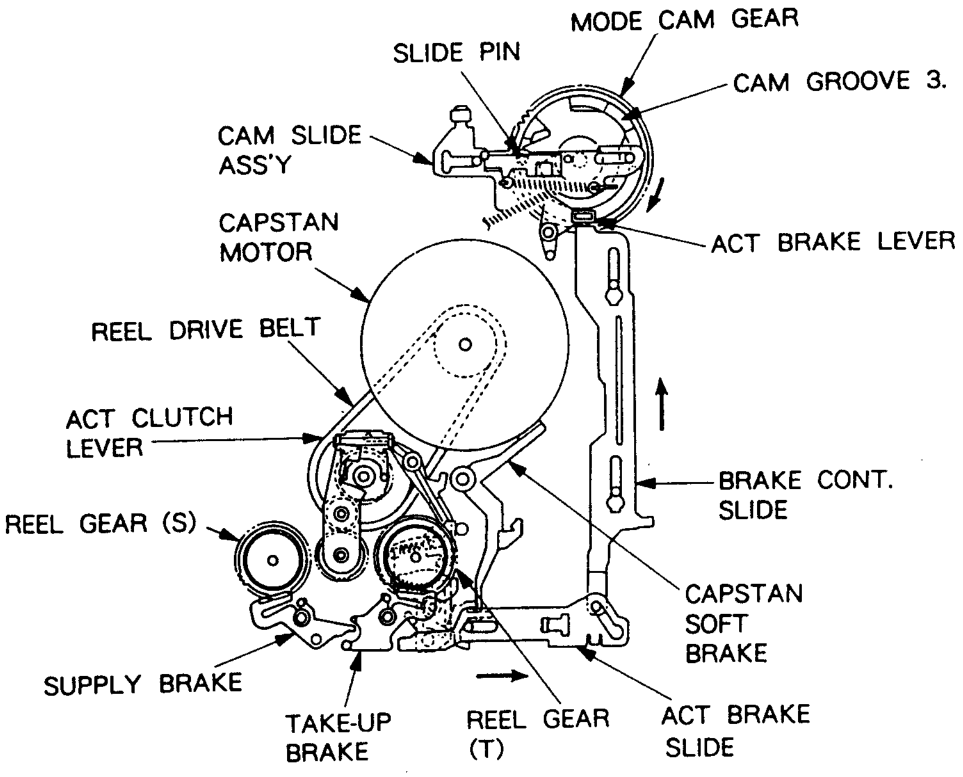
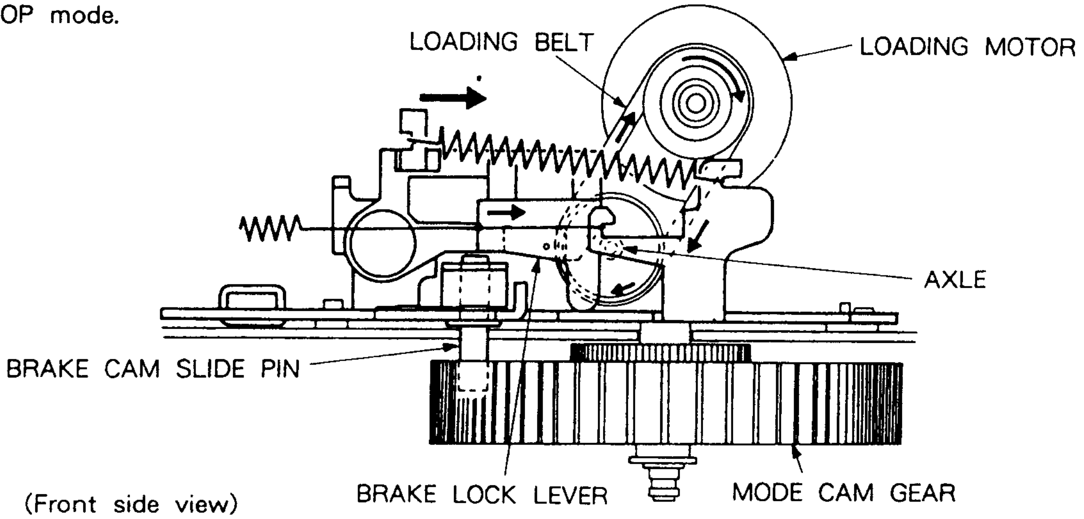

MODE CAM GEAR
SLIDE PIN
CAM GROOVE 3.
CAM SLIDE ASS'Y
CAPSTAN MOTOR
ACT BRAKE LEVER
REEL DRIVE BELT
ACT CLUTCH LEVER
BRAKE CONT. SLIDE
REEL GEAR (S)
CAPSTAN SOFT BRAKE
SUPPLY BRAKE
TAKE-UP BRAKE
REEL GEAR (T)
ACT BRAKE SLIDE

Fig.2-2-8. ⓑ Construction of Brake Control Plate (At Brake Mode)

(5) Brake Lock Release Mechanism (FF/REW → STOP Mode)

The brake lock momentary release mechanism is shown in Fig.2-2-9 ⓐ, ⓑ and Fig.2-2-10.
In the FF/REW mode (Fig.2-2-9 ⓐ) mechanical elastic load is given to the BRAKE LOCK LEVER mounted on the BRAKE CAM SLIDE which causes the brake to operate, and it is locked to the high-speed rotary axle of the 1st reducing section of the loading motor.

ⓐ changes from brake mode or lock released state to FF/REW, STOP mode.

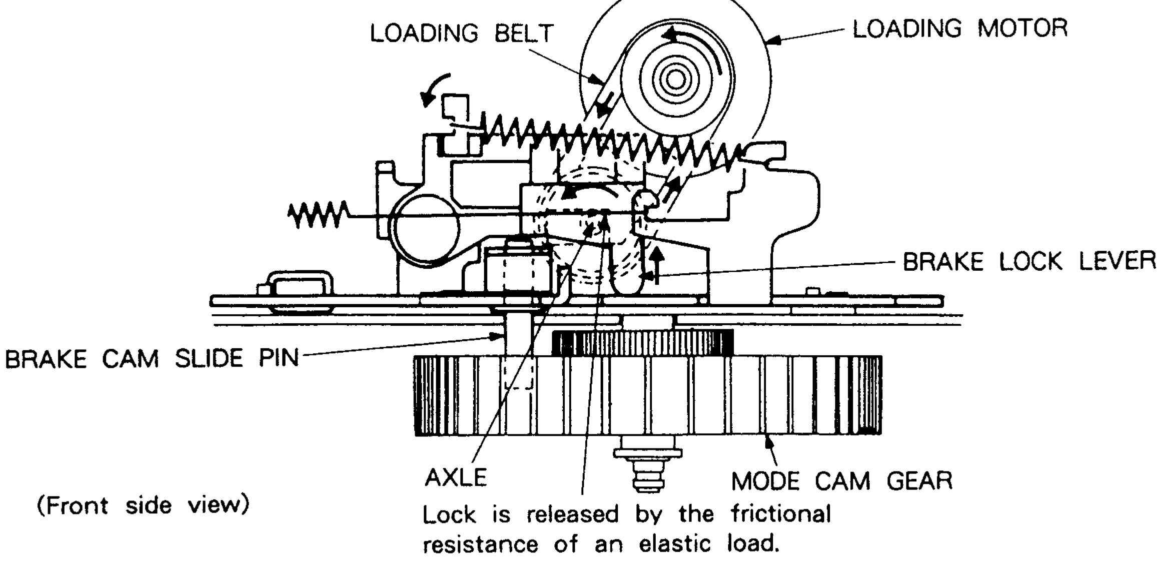

LOADING BELT
LOADING MOTOR
AXLE
BRAKE CAM SLIDE PIN
BRAKE LOCK LEVER
MODE CAM GEAR

(Front side view)

Fig.2-2-9.ⓐ **Brake Lock& Release Mechanism**

At the time of a shift to the STOP mode from the FF/REW (Fig.2-2-9ⓑ), the BRAKE LOCK LEVER releases the lock on slight rotation of the axle by contact between the rotary shaft and the friction resistance so that the brake can be instantaneously applied to the reel. The lock release speed is almost the same as the start-up of the loading motor. So, its response to the brake is very quick, and construction is simplified also.

ⓑ Changes from FF/REW, STOP mode to BRAKE mode.


LOADING BELT
LOADING MOTOR
BRAKE LOCK LEVER
BRAKE CAM SLIDE PIN
AXLE
MODE CAM GEAR
Lock is released by the frictional resistance of an elastic load.

(Front side view)

Fig.2-2-9.ⓑ **Brake Lock & Release Mechanism**

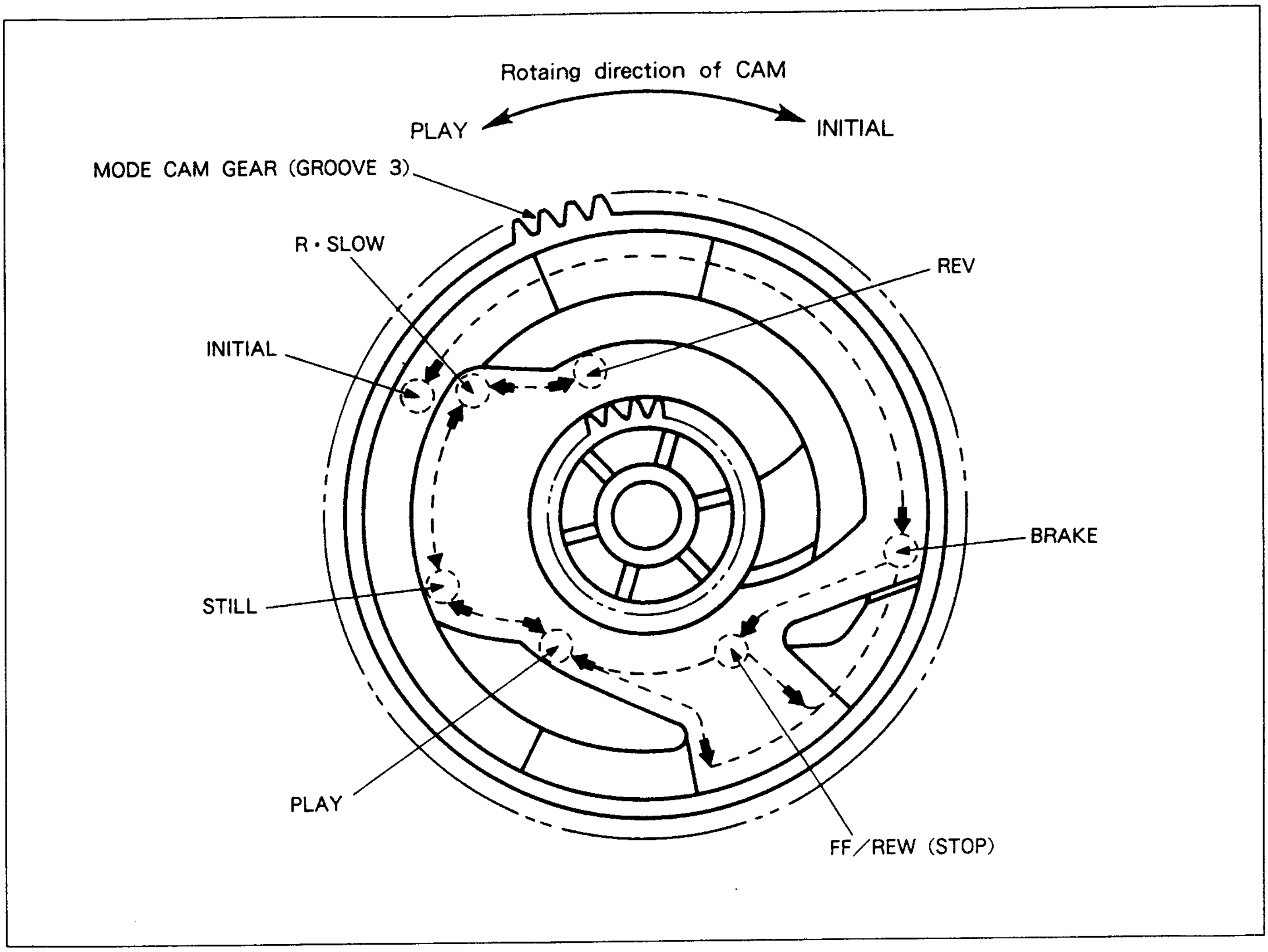


Fig. 2-2-10. ⓐ. Positioning of Brake Cam Slide-pin on the Groove 3 of Mode Cam Gear

In JOG SHUTTLE mechanism, it is necessary for the auxiliary brake (CAPSTAN SOFT BRAKE) to be press-fitted to the capstan motor promptly so that the stable image should be given immediately after the mode changes (for example, PLAY → STILL, PLAY → R/SLOW).

According to the rotation angle of the MODE CAM GEAR shown in Fig. 2-2-10 ⓐ, CAM SLIDE ASS'Y, ACT BRAKE LEVER, BRAKE CONT SLIDE, ACT BRAKE LEVER, BRAKE CONT SLIDE, ACT BRAKE SLIDE and CAPSTAN SOFT BRAKE interlock (See Fig. 2-2-8). In order to perform these brake control smoothly, the LOCK RELEASE LEVER is newly added to the CAM SLIDE ASS'Y. Though the BRAKE LOCK LEVER on the CAM SLIDE ASS'Y is locked on the high speed rotating axle (AXLE) as shown in Fig. 2-2-9 ⓑ during the FF/REW (STOP) mode, the lock is released by the LOCK RELEASE LEVER when changing the operation mode from PLAY to REV.

The operating condition in case of changing PLAY mode to STILL mode is shown in Fig. 2-2-10 ⓑ and Fig. 2-2-10. ⓒ.

In case of changing PLAY mode to STILL mode, the loading motor of the conventional mechanism (mechanism shown in P88 and P89) rotates clockwise rear to front.

However, in the JOG SHUTTLE mechanism, since the mode position of the MODE CAM GEAR is changed as shown in Fig. 2-2-10 ⓐ, the loading motor rotates counterclockwise in case of changing PLAY mode to STILL mode.

Therefore, since the first reduction gear of the loading motor, that is, high speed rotating axle (AXLE) rotates counterclockwise, lock of the BRAKE LOCK LEVER can not be released and then, in the conventional mechanism, the CAM SOFT ASS'Y can not be slided to be press-fitted to the CAPSTAN SOFT BRAKE. Then it is necessary to slide the ACT SLIDE PLATE in the direction of arrow A to push up the LOCK RELEASE LEVER as shown in Fig. 2-2-10 ⓓ in case of changing modes between PLAY and STILL. Then, the LOCK RELEASE LEVER pushes up the BRAKE LOCK LEVER to release the lock of the high speed rotating axle (AXLE). This enables the CAM SLIDE ASS'Y to slide freely.

Besides, the BRAKE LOCK LEVER is always pushed up in case of changing modes between PLAY and REV.

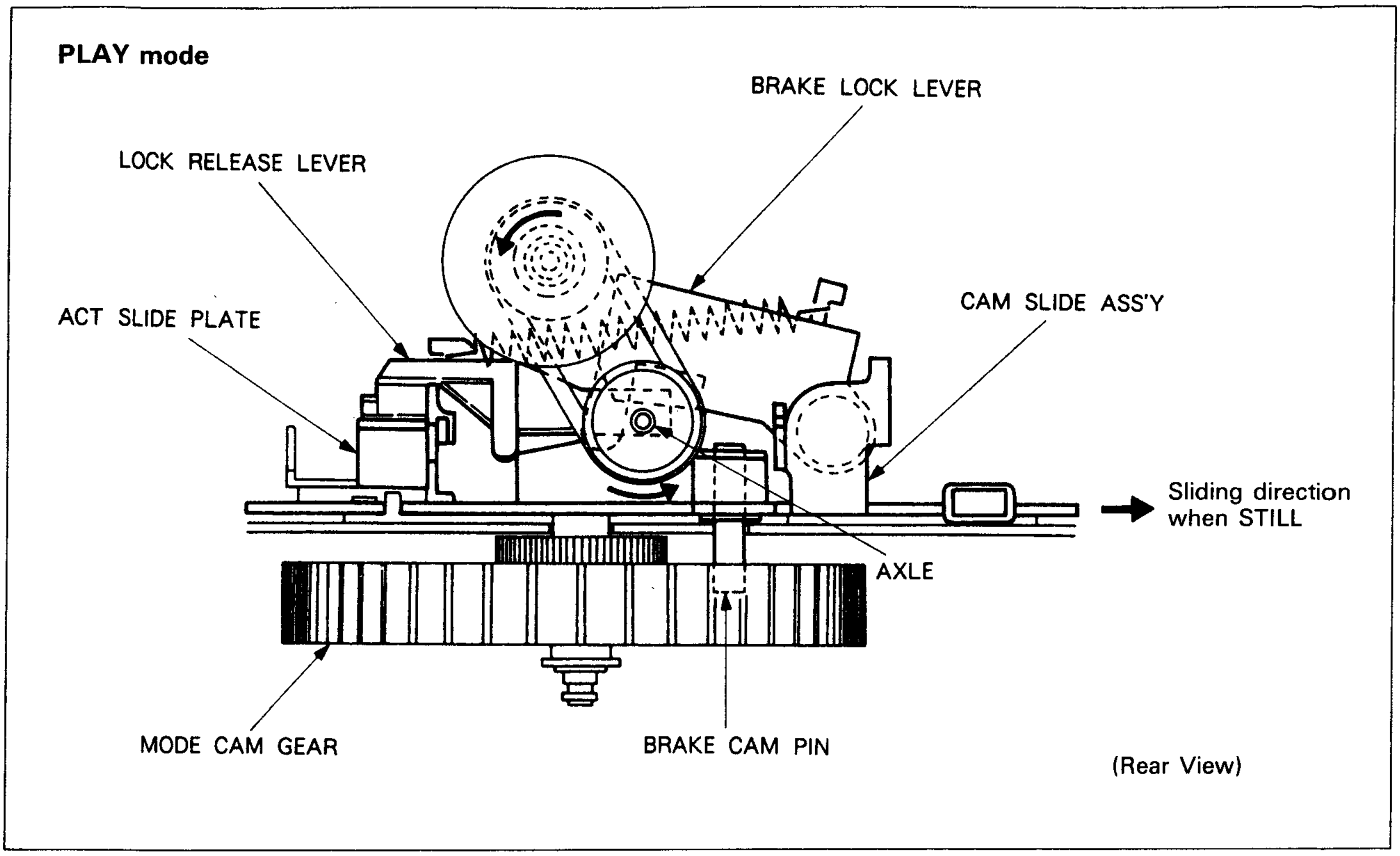

PLAY mode
BRAKE LOCK LEVER
LOCK RELEASE LEVER
ACT SLIDE PLATE
CAM SLIDE ASS'Y
Sliding direction when STILL
AXLE
MODE CAM GEAR
BRAKE CAM PIN
(Rear View)

Fig. 2-2-10. ⓑ. Brake Lock Release Mechanism (at playback mode)

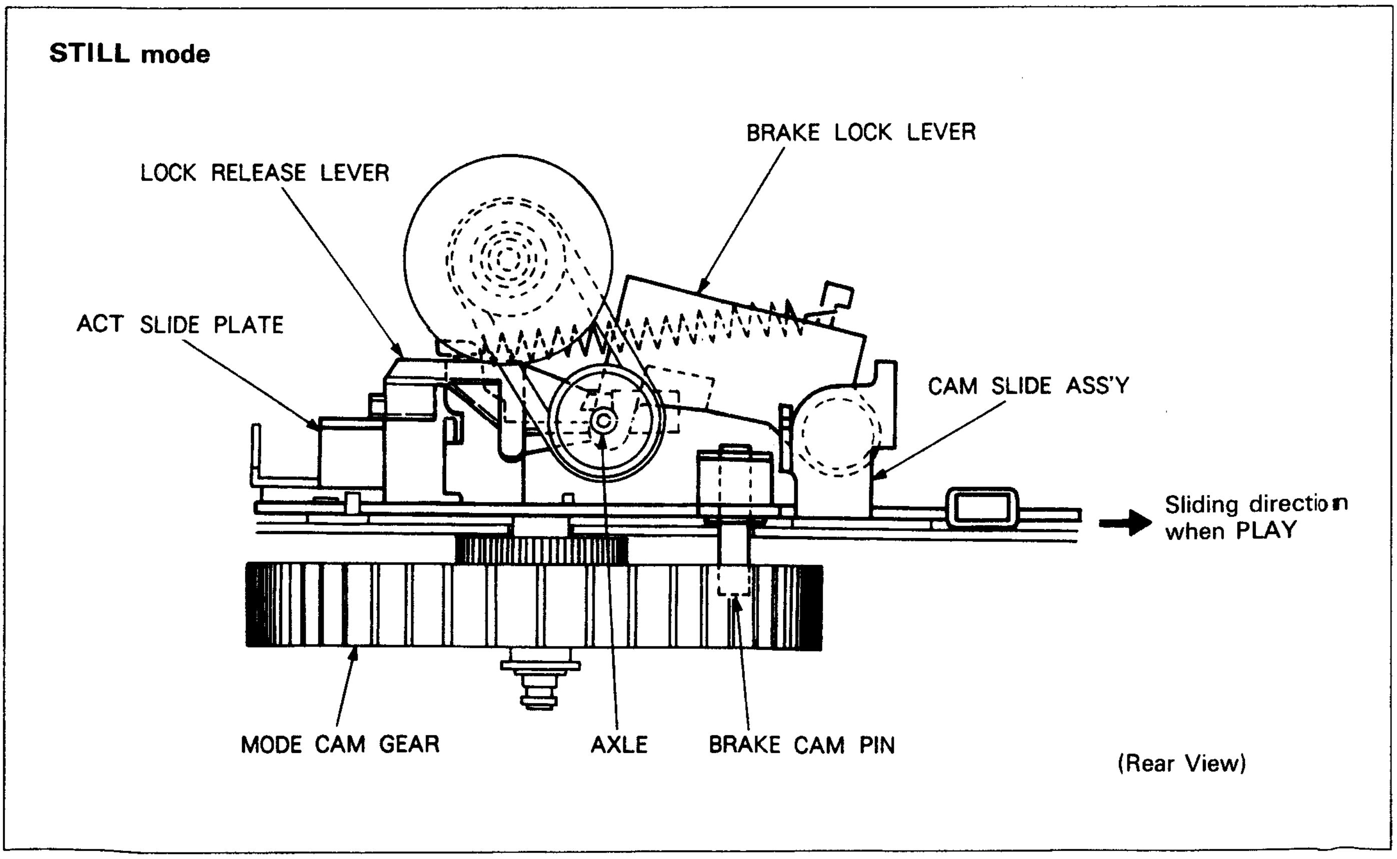

STILL mode
BRAKE LOCK LEVER
LOCK RELEASE LEVER
ACT SLIDE PLATE
CAM SLIDE ASS'Y
Sliding direction when PLAY
MODE CAM GEAR
AXLE
BRAKE CAM PIN
(Rear View)

Fig. 2-2-10. ⓒ. Brake Lock Release Mechanism (at STILL mode)

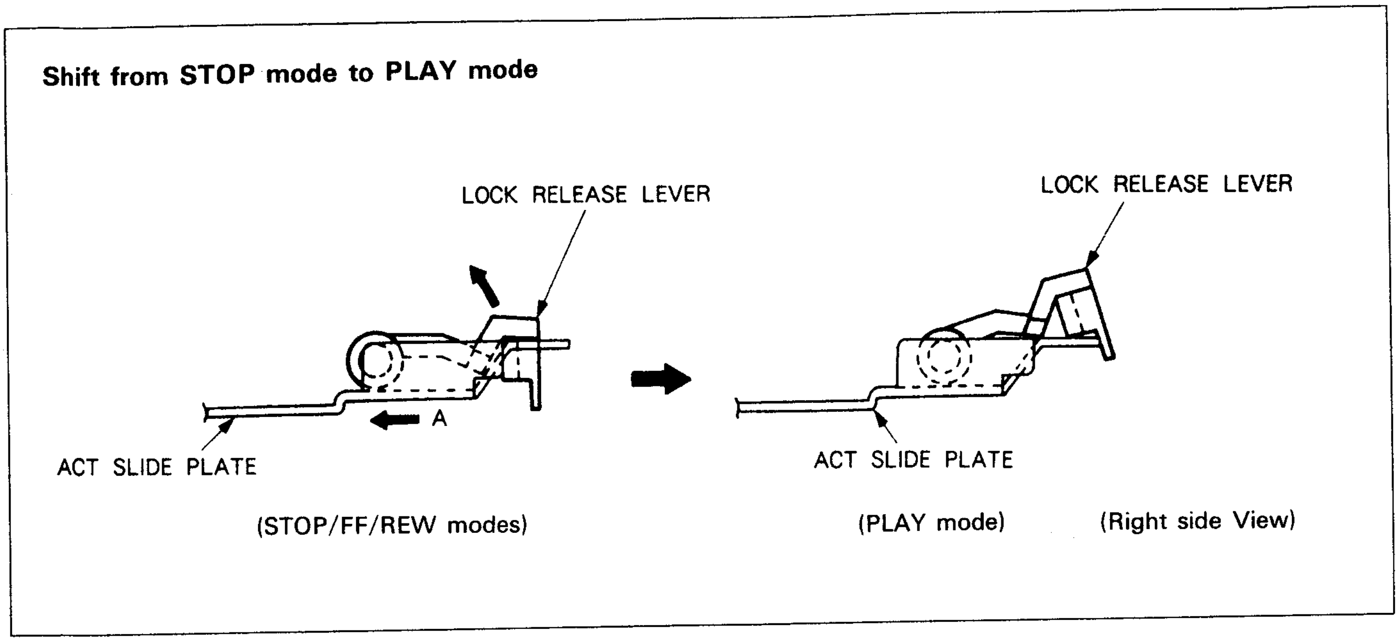

Shift from STOP mode to PLAY mode
LOCK RELEASE LEVER
A
ACT SLIDE PLATE
(STOP/FF/REW modes)
LOCK RELEASE LEVER
ACT SLIDE PLATE
(PLAY mode)
(Right side View)

Fig. 2-2-10. ⓓ. Brake Lock Release Mechanism

2-2-3. REEL TABLE DRIVE

(1) Reel Table Drive Mechanism

This mechanism employs the system of driving the tape from the DD capstan motor via rubber belt. In the tape constant speed running mode for PLAY, F-SEARCH, and R-SEARCH, the capstan and the pinch roller are press-fitted to allow the tape to run at a constant speed. By providing a FRICTION MECHANISM between the capstan motor and the reel table, the tape is taken up. In the FF/REW tape high-speed take-up mode, the capstan and the pinch roller are separated from each other, and the capstan motor and the reel table are linked direct by the clutch mechanism to carry out tape take-up. Also, to realize a thin type reel table drive section, the mechanism is simplified and the rotary parts are thinned for realization of physically compact design, and a step is provided on the reel table mounting section of the chassis by high-precision drawing process. A simplified figure of the drive mechanism is shown in Fig.2-2-11 and Fig.2-2-12. Power transmission to the pulley of the clutch mechanism section is done from the DD capstan motor via rubber belt.

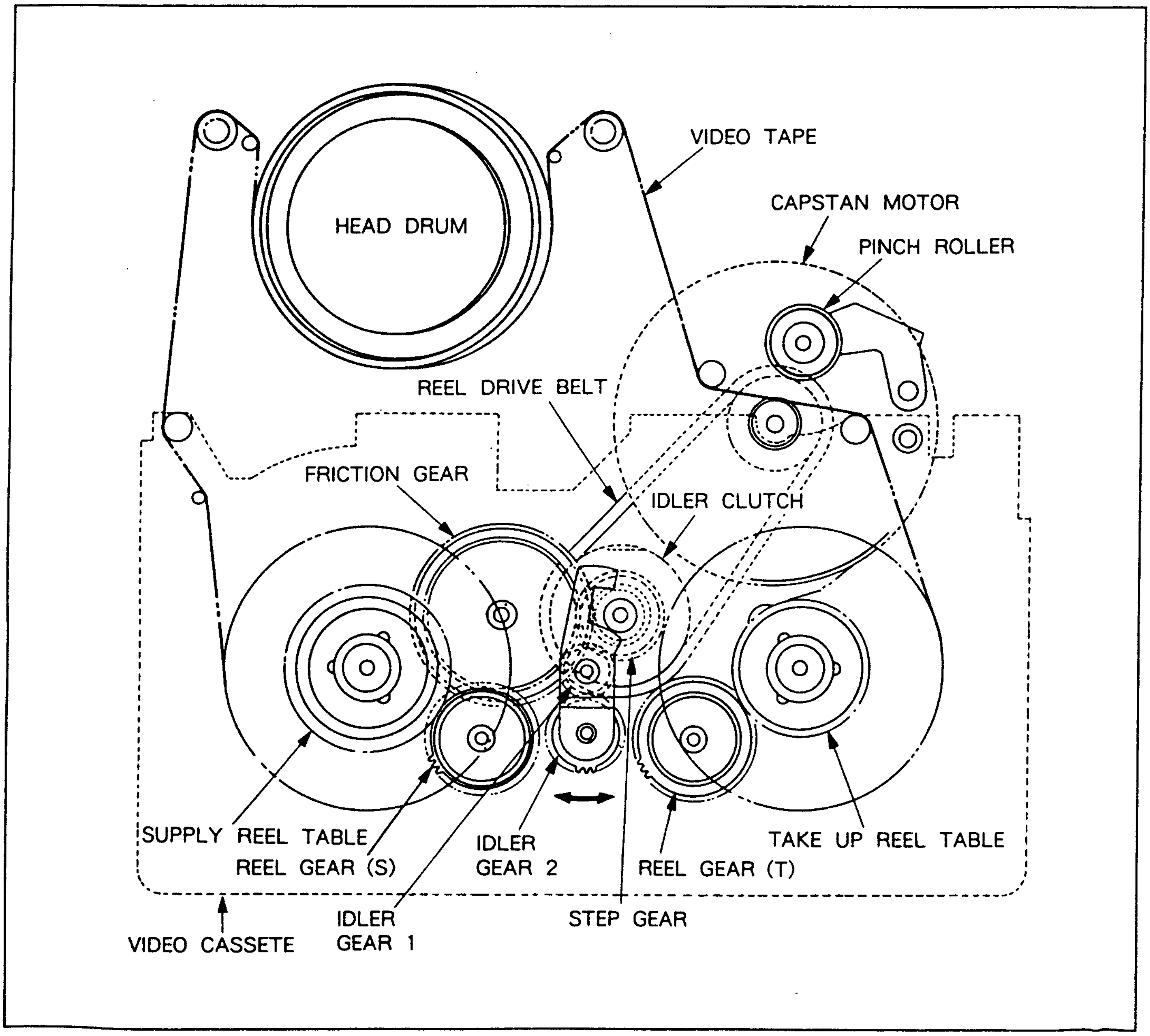

VIDEO TAPE
HEAD DRUM
CAPSTAN MOTOR
PINCH ROLLER
REEL DRIVE BELT
FRICTION GEAR
IDLER CLUTCH
SUPPLY REEL TABLE
REEL GEAR (S)
IDLER GEAR 2
TAKE UP REEL TABLE
REEL GEAR (T)
IDLER GEAR 1
STEP GEAR
VIDEO CASSETE

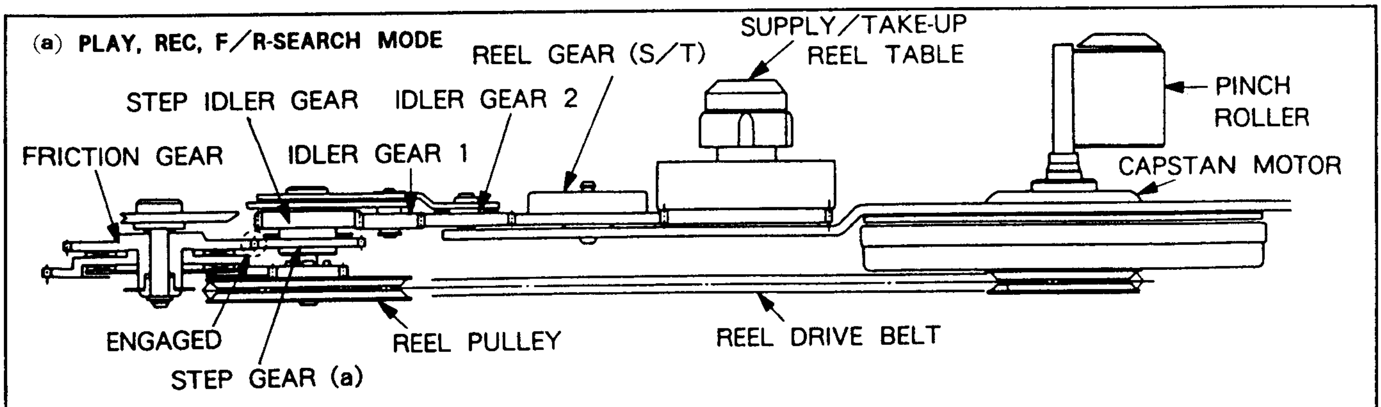
Fig.2-2-11. **Reel Table Drive**

The reel table winding speed and the torque needed in a wide variety of modes are obtained by shifting the up and down STEP GEAR positioned at the upper section of pulley. The selection of the STEP GEAR is precision controlled by the MODE CAM GEAR via the BRAKE CONTROL SLIDE. With the up and down STEP GEAR down, the clutch mechanism is directly linked, and the transmission power from the capstan motor is sent to the reel table via IDLER GEAR assembly and REEL GEAR (S/T). On the other hand, FRICTION MECHANISM acts between the pulley and the STEP GEAR when the up and down STEP GEAR are in the elevated state, thereby controlling the transmission torque for generation of the take-up slip. Normally, it is desirable that the take-up torque of the reel table is higher in the R-SEARCH mode than that in the PLAY mode. This is because in the forward tape running the tape winding load to the HEAD DRUM has to be taken care of the capstan and the pinch roller.
While, in the reverse tape running mode the winding load has to be taken on the take-up reel table. In the special playback operation, a mechanism for varying the take-up torque of the reel table is required to be changed depending upon the running direction of the tape. But in this mechanism, the torque selection is made by varying the reduction speed ratio up to the reel table from the capstan motor on both the forward side and the reverse side of the tape. Also, design simplification of the selection mechanism is realized by using a single friction mechanism. In other words, the take-up torque necessary for forward/reverse rotation is obtained by controlling the capstan motor speed.

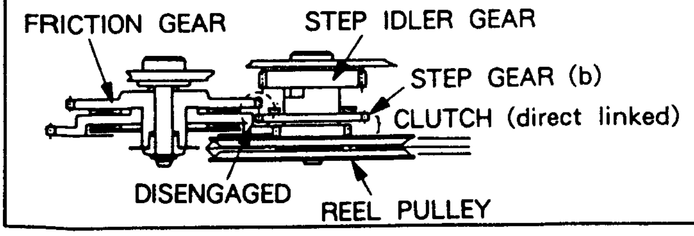
Rotation speed and torque needed for each mode of operation are converted by clutch mechanism for transmission of the drive power to the idler mechanism. The left and right moving IDLER GEAR assembly is automatically rotated to the left and the right according to the direction of capstan motor rotation by using the friction force. Because the mechanism is so designed as to drive the reel table of the side on which the tape is transported by the capstan and pinch roller, the forward and reverse constant speed drive (the PLAY, REC, F/R SEARCH modes) is carried out in the state in which the FRICTION MECHANISM is being operated. (Fig. 2-2-12ⓐ.) On the other hand, in the condition in which the friction mechanism is not in operation, the forward/reverse high speed drive (FF/REW mode) is made possible. (Fig.2-2-12 ⓑ.) Also, the reel drive in all modes is taken care of by the single left and right moving idler for design simplification.

The idler body employs gear drive to improve reliability with a view to realizing parts thinning while securing the transmission reliability. Using a resin molded gear as material of an idler, the efficiency of the entire reel drive system has been improved because there are no deformation and loss, and minimized rotation moving torque necessary for biting-in as in the case of a material such as rubber which shows considerable elastic deformation, etc. Further in this mechanism, an intermediate gear is provided between the reel side and the idler to minimize the rotating and moving angle of the left and right moving idlers, thereby holding the reversing time to a minimum when shifting to the tape running direction change mode. This results in significantly reduced possibility of tape looseness.

(a) **PLAY, REC, F/R-SEARCH MODE**



(b) **F-FWD/REW, STOP MODE**



(a) The clutch mechanism is disengaged, and rorational force is transmitted through the friction mechanism. (Constant speed rotating mode)

(b) Direct transmission is obtained by disengaging the friction mechanism with a clutch mechanism. (High-speed rotating mode)

Fig.2-2-12. **Reel Table Drive (Side View)**

(2) Reel Table Drive Clutch Lock and Release Mechanism

As described in the preceding section, using the selection of the step gear (CLUTCH MECHANISM), two mechanisms which are driven by being selected via direct drive or via FRICTION MECHANISM from the capstan motor, to execute the reel table drive. The operating status of the clutch lock and the releasing mechanism is shown in Fig.2-2-13.

Fig. 2-2-13 ① shows the tape unloading position (INITIAL position) when the power for the mechanism operating mode is switched off.

At that times all the levers are in the initial positions, and the clutch is released also so that a route for reel table drive is created via a friction mechanism.

Fig.2-2-13 ② shows that the mechanism operation mode has executed the tape loading and that it has completed its movement to the STOP (stand-by), FF/REW position.

At this time, the CLUTCH ACT LEVER is operated by the hook of the ACT BRAKE SLIDE to move the ACT CLUTCH LEVER in the direction of arrow via the CLUTCH LEVER and the CLUTCH CHANGE LEVER. Now, the up and down STEP GEAR is placed into the direct coupled state. In the FF/REW mode, the reel table is directly driven so that the rotation of the capstan motor is directly transmitted to make high-speed rotation drive possible. When shifting the mode to the STOP from the FF/REW in this condition, the mechanism mode position is once moved back to the brake position, and when the reel table brake is instantaneously applied, the clutch is released once at the same time, after which it returns to the same mechanism mode as the FF/REW mode once again. Now, it is placed in a waiting state in the same condition of the STOP mode as shown in Fig.2-2-13 ②.

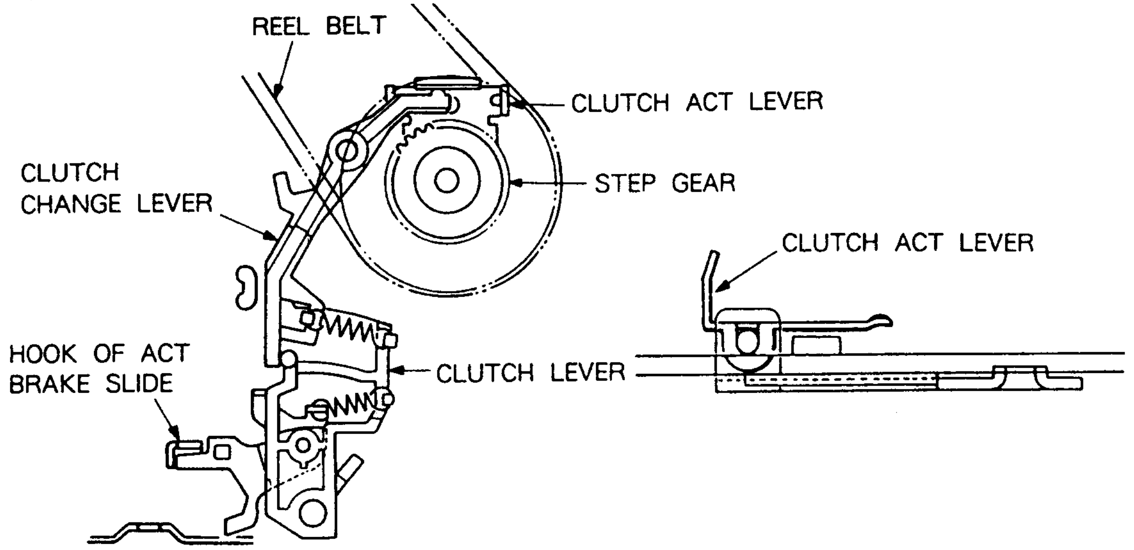

REEL BELT
CLUTCH ACT LEVER
CLUTCH CHANGE LEVER
STEP GEAR
CLUTCH ACT LEVER
HOOK OF ACT BRAKE SLIDE
CLUTCH LEVER

Fig.2-2-13.① **Initial Mode (Power OFF)**

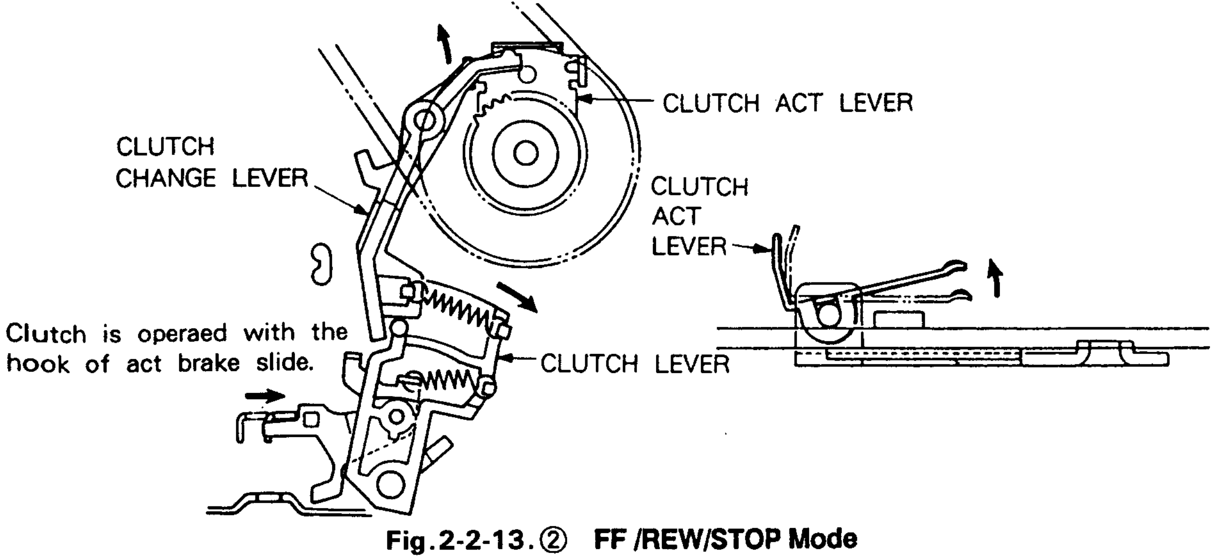

CLUTCH ACT LEVER
CLUTCH CHANGE LEVER
CLUTCH ACT LEVER
Clutch is operaed with the hook of act brake slide.
CLUTCH LEVER

Fig.2-2-13.② **FF /REW/STOP Mode**

Fig.2-2-13.①-③ **Reel Table Drive Cluth Lock and Release Mechanism**

Fig.2-2-13 ③ shows the completion state of a shift to the PLAY mode via the STILL mode from the STOP (FF/REW) mode for the mechanism mode position.
In the case of this mode shifting, the movement of the BRAKE ACT SLIDE remains fixed. So, the CLUTCH ACT LEVER should be unlocked by the movement of the hook of the MAIN SLIDE PLATE to cause the clutch to be released. This movement in turn causes the capstan motor rotation to be transmitted via the friction mechanism. So, the constant speed rotation drive necessary for the PLAY (REC) mode and SEARCH mode is made possible.

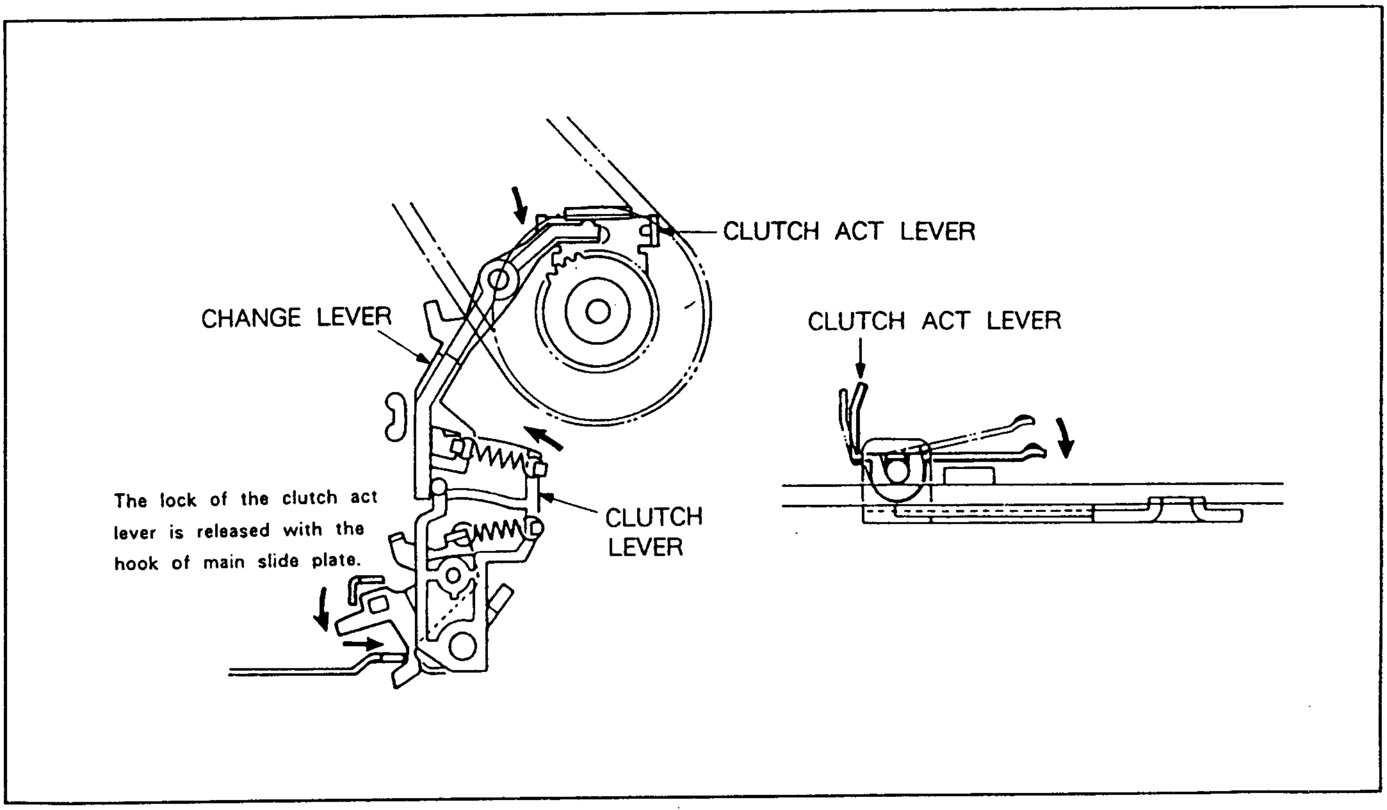

CLUTCH ACT LEVER
CHANGE LEVER
CLUTCH ACT LEVER
The lock of the clutch act lever is released with the hook of main slide plate.
CLUTCH LEVER

Fig.2-2-13.③ **FF/REW/STOP Mode→STILL Mode→PLAY Mode**

2-2-4. FRONT LOADING DRIVE SELECTION MECHANISM

In the P91 mechanism, the motor dedicated to the use of front loading is not employed. The drive source is utilized instead of the tape loading motor. As shown in Fig.2-2-14 ⓐ/ⓑ, during the front loading the FRONT LOAD WORM GEAR is directly coupled to the tape loading motor axle and the FRONT HELICAL GEAR with several teeth missing are engaged with each other and rotated for transmission of the drive force to the front loading mechanism. When the cassette tape is inserted completely in the mechanism, the FRONT HELICAL GEAR is automatically disengaged from the FRONT LOAD WORM GEAR. After that, the tape loading operation is performed without the tape loading motor drive force being transmitted to the front loading mechanism.

While the drive force is being transmitted to the front loading mechanism, the CAM GROOVEs of the before-mentioned MAIN CAM GEAR and the MODE CAM GEAR are flat in cam line pattern. These are therefore held without changing the mode state of the mechanism in any way.

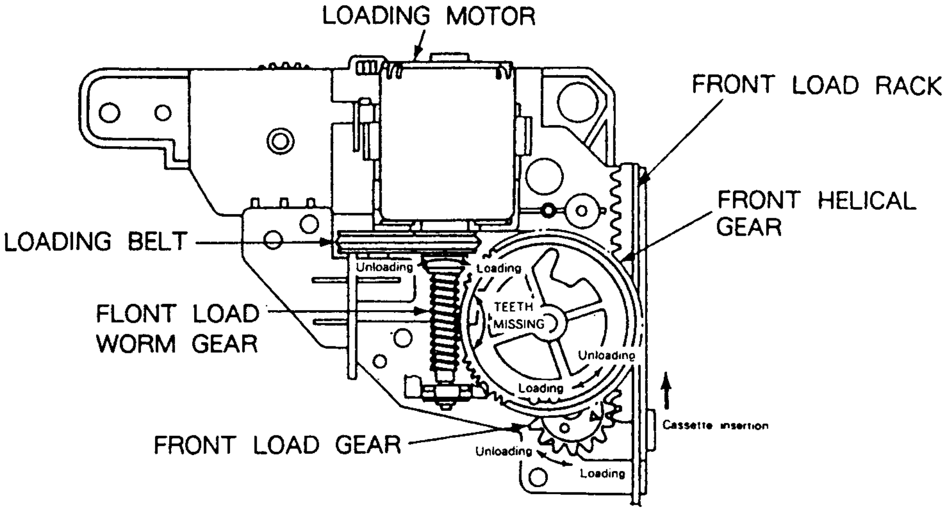

LOADING MOTOR
FRONT LOAD RACK
FRONT HELICAL GEAR
LOADING BELT
FLONT LOAD WORM GEAR
FRONT LOAD GEAR
Unloading
Loading
TEETH MISSING
Unloading
Loading
Cassette insertion
Unloading
Loading

Fig.2-2-14.ⓐ **Front Loading Drive Selection Mechanism (Cassette-Inserted Position)**

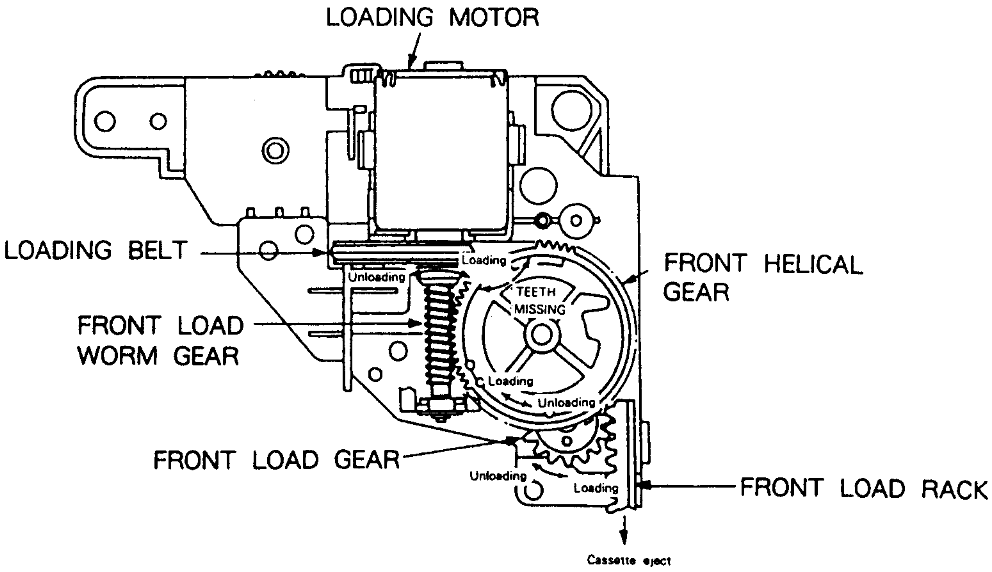

LOADING MOTOR
LOADING BELT
Loading
Unloading
TEETH MISSING
FRONT HELICAL GEAR
FRONT LOAD WORM GEAR
Loading
Unloading
FRONT LOAD GEAR
Unloading
Loading
FRONT LOAD RACK
Cassette eject

Fig.2-2-14.ⓑ **Front Loading Drive Selection Mechanism (Cassette-Ejected Position)**

(A) Cassette inserting operation

When inserting a cassette from the cassette ejected state of Fig. 2-2-14 ⓑ, the FL START SWITCH shown in Fig. 2-2-15 is turned OFF, to cause the loading motor to be rotated in the direction of inserting. As a result, the FRONT LOAD RACK is drawn in, and the front loading is made up to the cassette tape completion point. So, it is locked in the grooves shown in Fig. 2-2-15 to complete cassette inserting. At that time, the FRONT HELICAL GEAR is positioned at ⓐ of Fig. 2-2-14, and is released from the front loading mechanism, therefore, the tape loading operation is continuously performed.

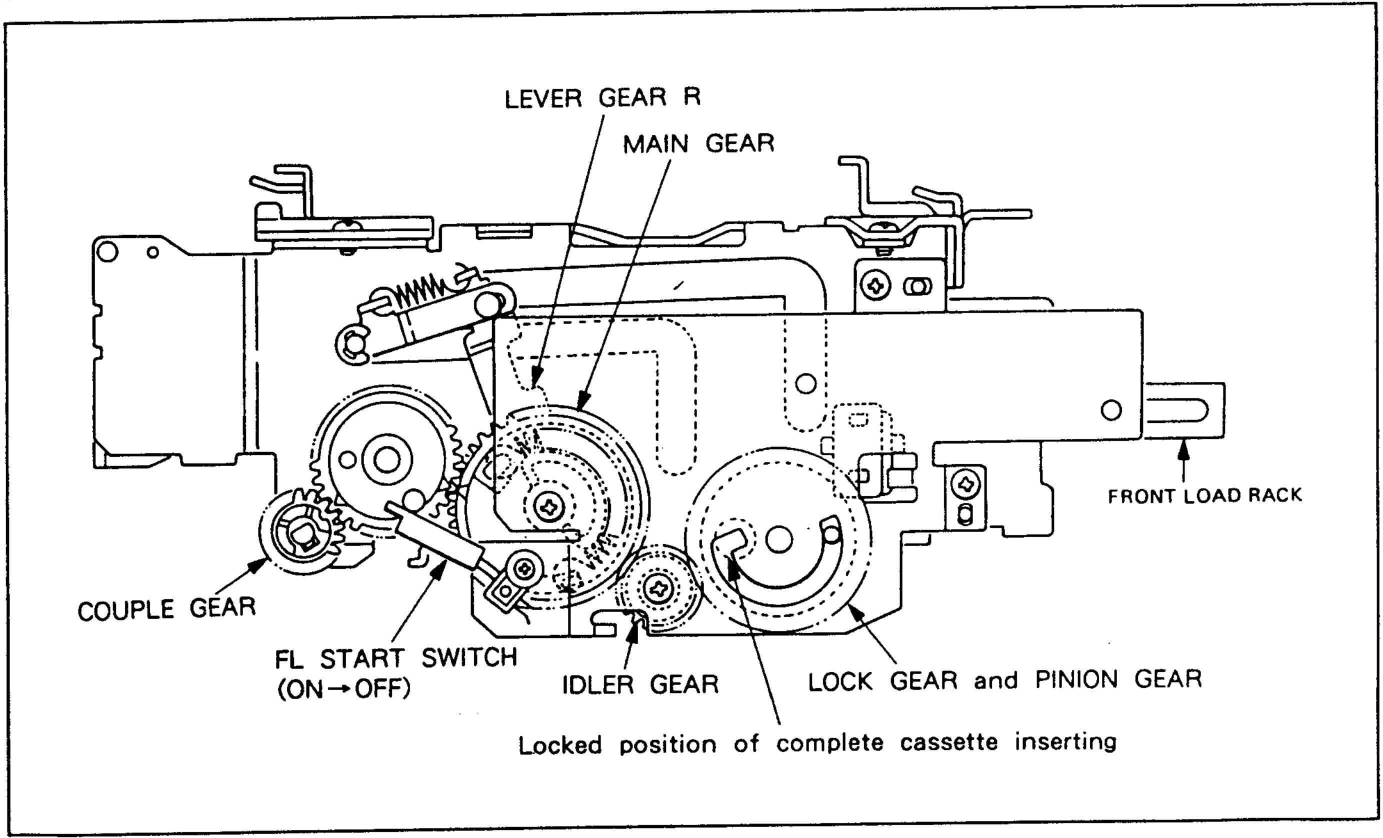

LEVER GEAR R
MAIN GEAR
FRONT LOAD RACK
COUPLE GEAR
FL START SWITCH
(ON→OFF)
IDLER GEAR
LOCK GEAR and PINION GEAR
Locked position of complete cassette inserting

Fig.2-2-15. **Cassette Holder Mechanism (Cassette Inserting Operation)**

(B) Cassette ejection operation

The components of the front loading mechanism is shown in Fig.2-2-16.

When ejecting the cassette from the inserted state shown in Fig.2-2-17, the FRONT ACT LEVER is pushed in the direction of arrow due to the ACT SLIDE PLATE moves in the direction of arrow shown in Fig.2-2-17. As a result, the FRONT LEVER assembly is turned counterclockwise via the FRONT LOAD SLIDE to cause the FRONT HELICAL GEAR to be engaged with the FRONT LOAD WORM GEAR of the loading motor. At that time, the loading motor is being rotated counterclockwise, so that the FRONT HELICAL GEAR is caused to be rotated counterclockwise also to carry out the front unloading via the FRONT LOAD GEAR and the FRONT LOAD RACK. At the same time, the FRONT ACT LEVER is operated counterclockwise by the hook of the FRONT HELICAL GEAR. This releases the lock being pushed in the direction of arrow indicated by the ACT SLIDE PLATE. So, the FRONT LOAD SLIDE assembly now moves to the initial position to prepare for the next ejection operation. Incidentally, the movement of the FRONT LEVER assembly performs an important function of positioning the FRONT HELICAL GEAR (Fig.2-2-14ⓐ) upon completion of cassette mounting, in addition to the cassette eject start-up operation.

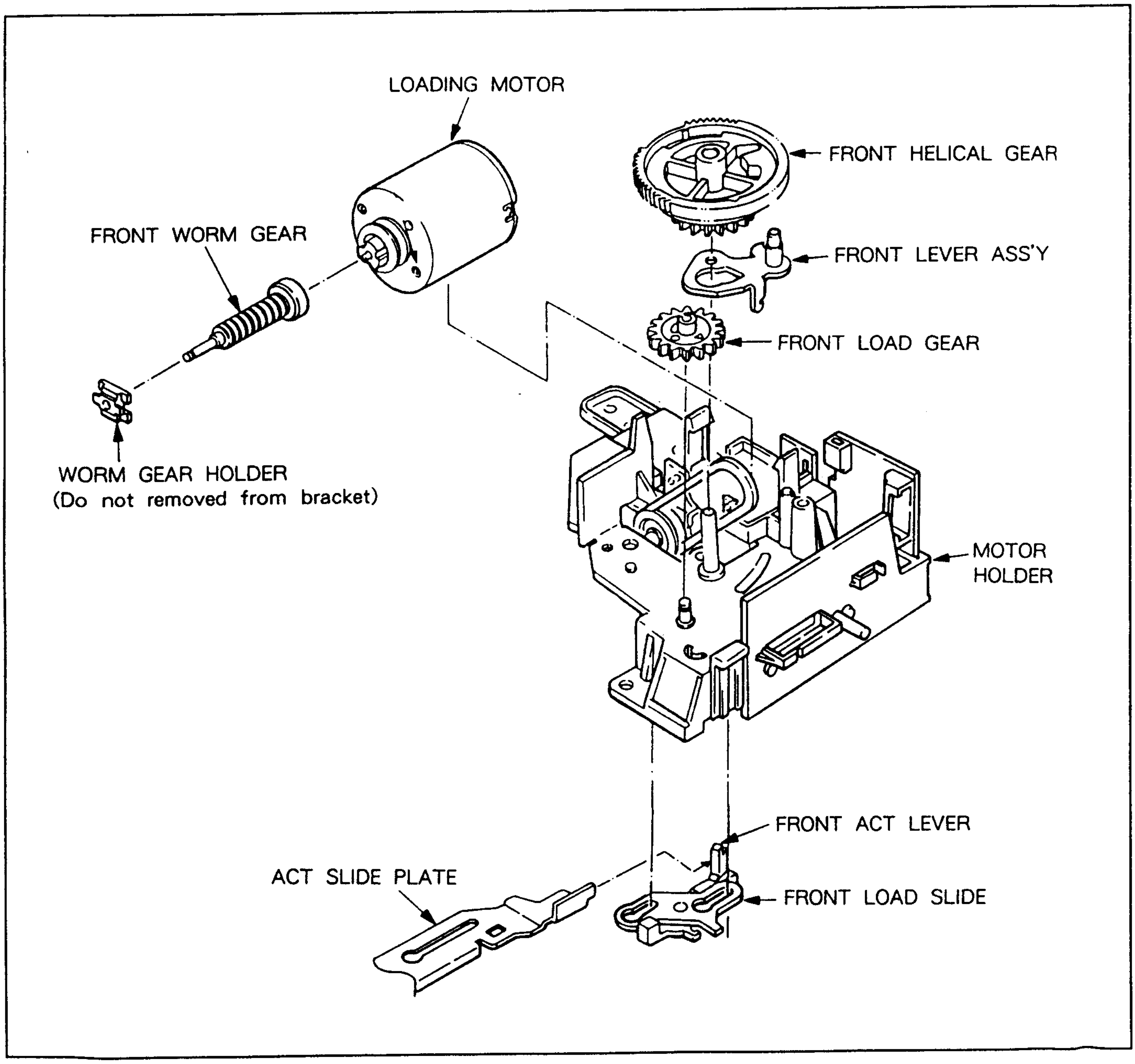
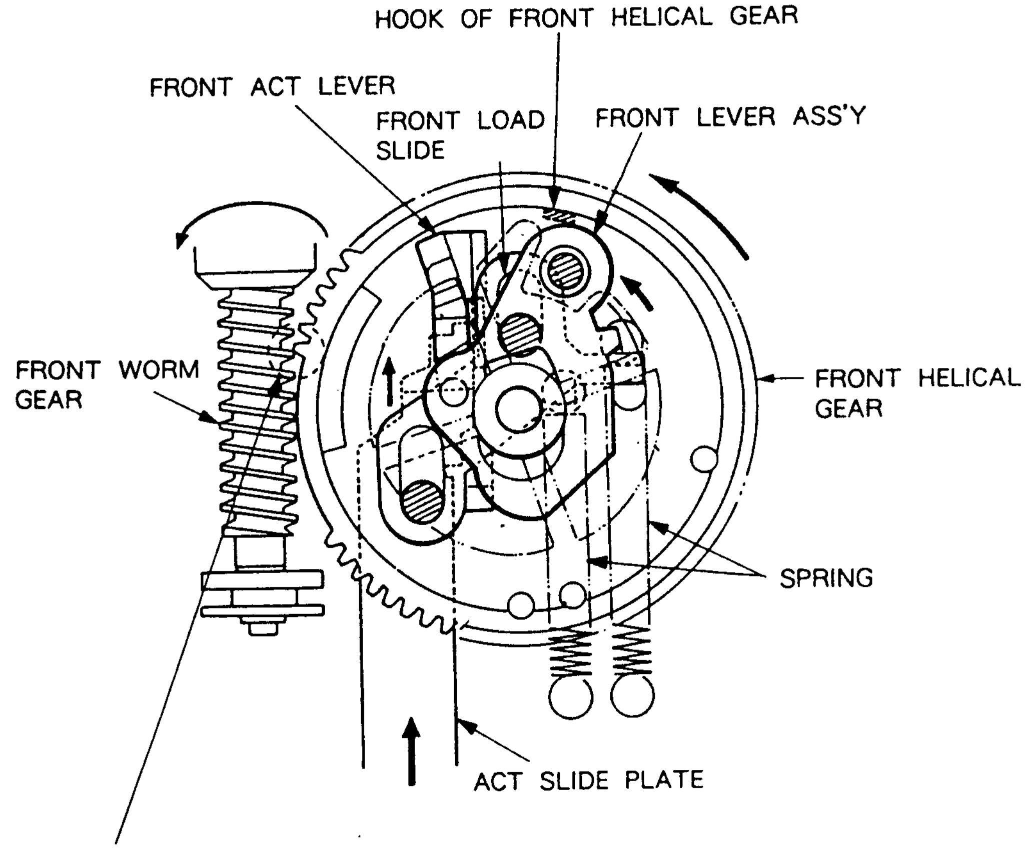

LOADING MOTOR
FRONT HELICAL GEAR
FRONT WORM GEAR
FRONT LEVER ASS'Y
FRONT LOAD GEAR
WORM GEAR HOLDER
(Do not removed from bracket)
MOTOR HOLDER
FRONT ACT LEVER
ACT SLIDE PLATE
FRONT LOAD SLIDE

Fig.2-2-16. **Front Loading Drive Selection Mechanism**


HOOK OF FRONT HELICAL GEAR
FRONT ACT LEVER
FRONT LOAD SLIDE
FRONT LEVER ASS'Y
FRONT WORM GEAR
FRONT HELICAL GEAR
SPRING
ACT SLIDE PLATE

By pressing the front act lever with the act slide plate, the front worm gear is engaged with the front helical gear, and starts the operation to eject the cassette.

Fig.2-2-17. Cassette Ejection Start Operation (See through top view)

2-2-5. AUTO HEAD CLEANING MECHANISM

Auto head cleaning mechanism consistes of parts as shown in Fig.2-2-18. The function of the MAIN CAM is improved by changing the circumference shape. LEVER CLEANER ASS'Y pin is always pressed against circumference of this MAIN CAM by TORSION COILED SPRING. Therefore it is possible to get the LEVER CLEANER ASS'Y operation according to the main cam rotation (circumference uneven).

The ROLLER CLEANER ASS'Y is attached on the tip part of the LEVER CLEANER ASS'Y so that it clean the rotary head by pressing against drum (cylinder) when loading and unloading.

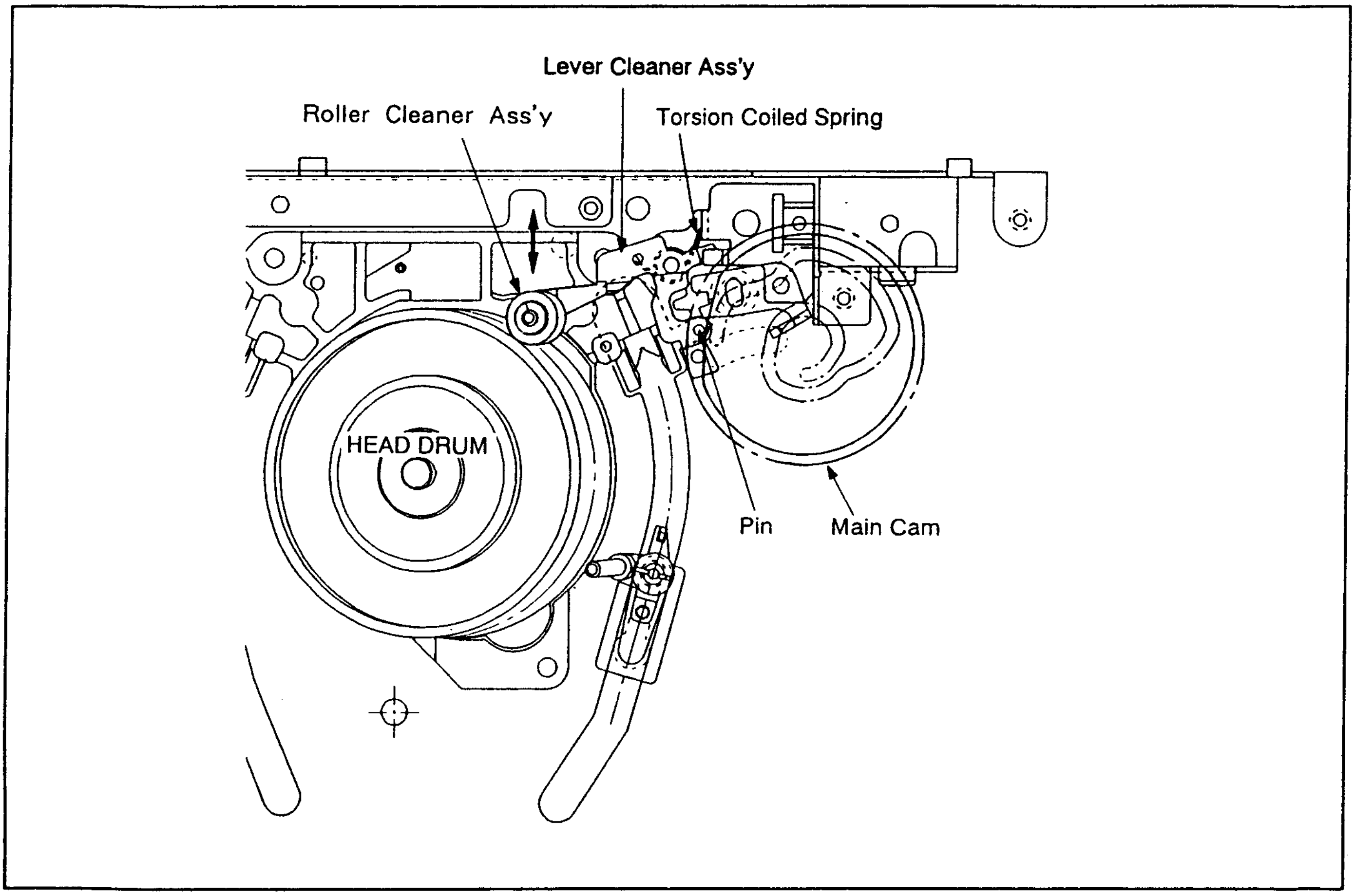

Lever Cleaner Ass'y
Roller Cleaner Ass'y
Torsion Coiled Spring
HEAD DRUM
Pin
Main Cam

Fig.2-2-18. **Auto Head Cleaning Mechanism**

2-2-6. CASSETTE HOLDER MECHANISM

(1) Components

The exploded view of the cassette holder mechanism is shown in Fig.2-2-18. This mechanism consists of a cassette tray for feeding the cassette tape to the specified position of the mechanism chassis, a side plate provided with L type holes for supporting and guiding it, the top plate for regulating the width of left and right, and a group of gears for driving the cassette tray.
The entire mechanism is of independent construction from the mechanism body. The holder is fixed on the mechanism chassis by inserting the hooks at two points and tightening the setscrews at two points, total four points.

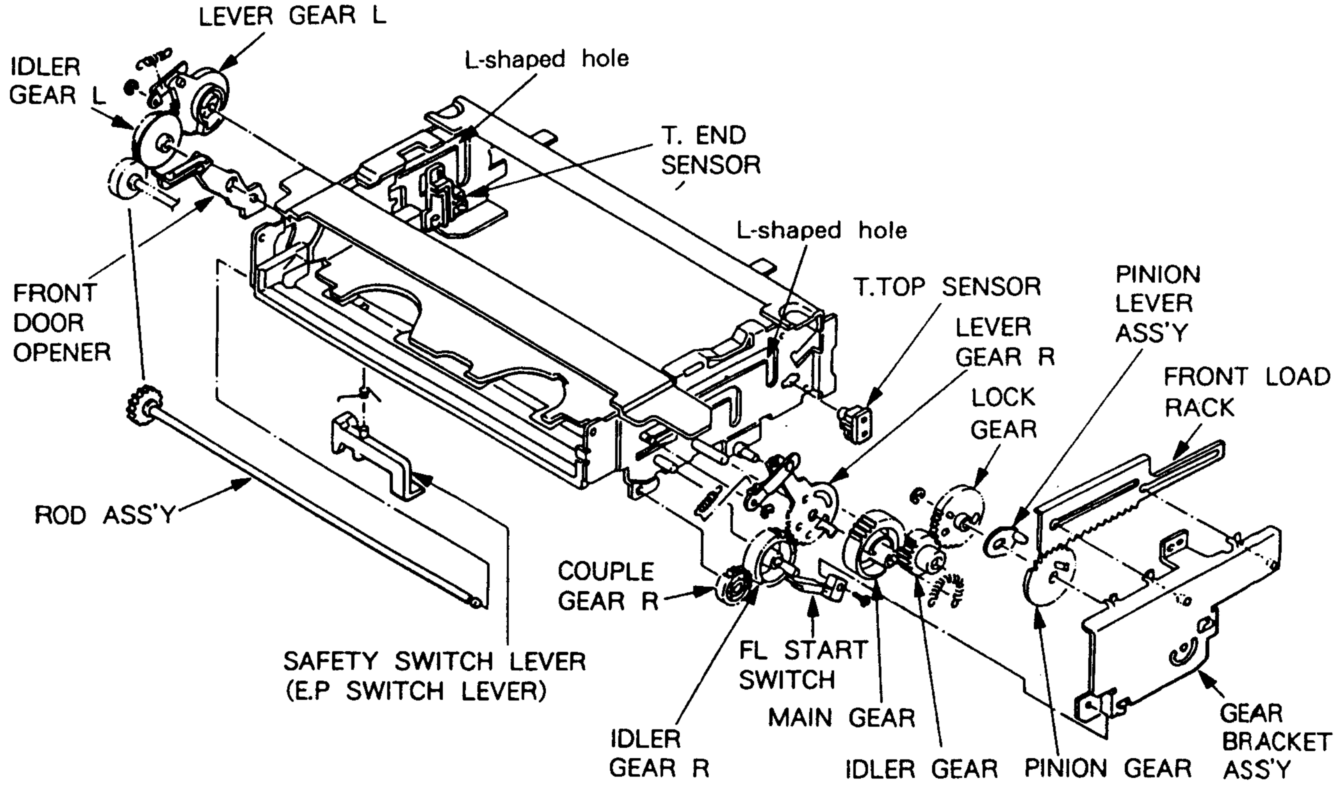

LEVER GEAR L
IDLER GEAR L
L-shaped hole
T. END SENSOR
L-shaped hole
FRONT DOOR OPENER
T.TOP SENSOR
PINION LEVER ASS'Y
LEVER GEAR R
FRONT LOAD RACK
LOCK GEAR
ROD ASS'Y
COUPLE GEAR R
SAFETY SWITCH LEVER (E.P SWITCH LEVER)
FL START SWITCH
MAIN GEAR
IDLER GEAR R
IDLER GEAR
PINION GEAR
GEAR BRACKET ASS'Y

Fig.2-2-19. **Exploded View of the Cassette Holder Mechanism**

(2) Description of Cassette Holder

The cassette holder is of motor-less design, as the lowering of mechanism height and driving source are done by the loading motor of the mechanism body.

As a substitute for the worm gear system hitherto used in the major drive section for the drive selection mechanism mentioned in section 2-2-4., the RACK LOADING system is adopted in this cassette holder mechanism. By this mechanism the motor-less design can be realized. An exploded view of the mechanism is shown in Fig.2-2-19. A description of the operation is made below along with Fig.2-2-19. To press-fit the cassette tape after sending it onto the mechanism chassis, the PINION GEAR section has triple construction. The FRONT LOAD RACK side and the IDLER GEAR side are independently engaged. The PINION GEAR and the LOCK GEAR are connected from the PINION LEVER PIN riveted to the PINION LEVER. Even after feeding the cassette tape to the specified position of the mechanism chassis, the FRONT LOAD RACK slides, giving the rotation to the PINION GEAR which is engaged with the FRONT LOAD RACK. At that time, a pin is dropped into the groove section provided on the GEAR BRACKET ASS'Y.

The other LOCK GEAR is fixed by this PINION LEVER PIN, and the cassette tape is press-fitted onto the mechanism chassis by linked IDLER GEAR. The before-mentioned FRONT LOAD RACK and the PINION GEAR are set free after dropping the PINION LEVER PIN into the groove section. So, the drive force of the loading motor is sent to the mechanism body.

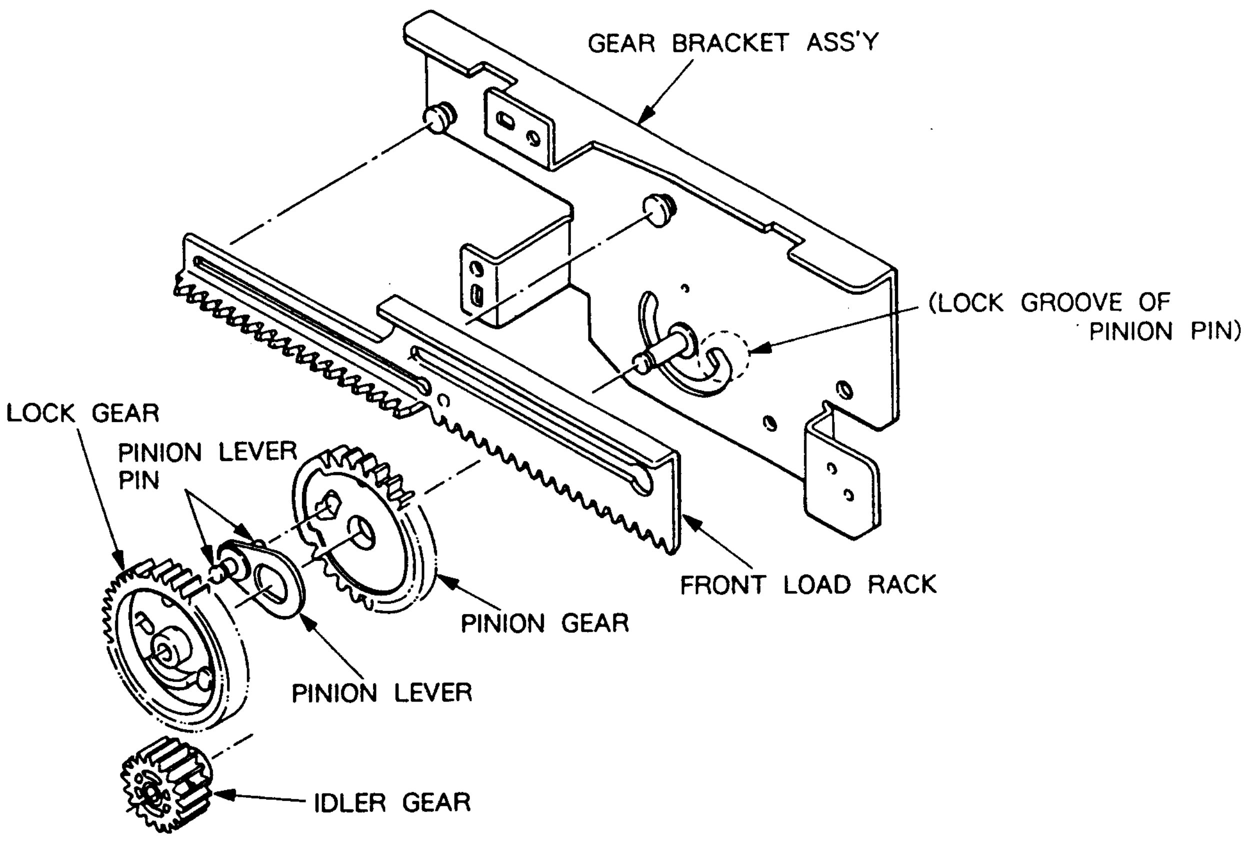


Fig.2-2-20. Rack Loading Mechanism of Cassette Holder

2-3. MECHANISM CONTROL

2-3-1. MODE ARRANGEMENT

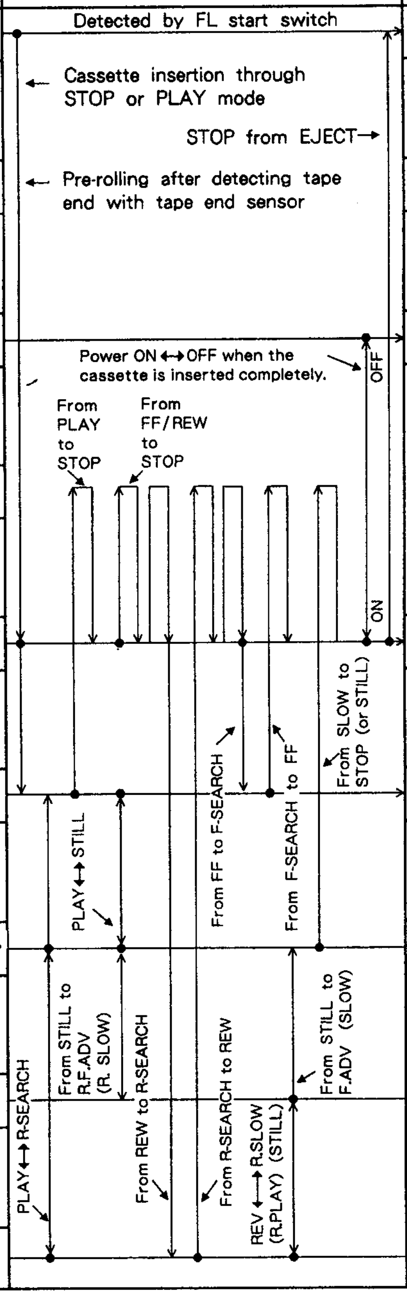
This mechanism is arranged in such a mode layout as shown in Table. 2-3-1 and as described in section 2-2-1. The mode sensing switch described below is used for control of these modes.

2-3-2. MODE DETECTION SWITCH

For mode detection, two leaf switches (FL START SWITCH and FL END SWITCH) and one rotary switch (MECHANISM MODE SWITCH) are used in combination.

Mechanism Mode	Mechanism Mode Switch 2	1	0	HEX DATA	Function	VTR Operation Mode
EJECT	–	–	–		Eject position	EJECT
					↑ Front loading/Unloading ↓	
SHORT REW	–	–	–		Take up operation in the tape end position	Detected by FL END switch
INITIAL	1	1	1	⑦	Power off position	Power off when tape is loaded completely
					Tape unloading position ↑ Tape loading ↓ Tape loading ending position	
BRAKE	0	0	1	①	Main brake applying position	
STOP/ FF/REW	0	1	0	②	STOP waiting and FF/REW (the head motor rotation)	STOP, FF/REW
PLAY	0	1	1	③	From FWD direction Normal running mode	PLAY,REC, F-SEARCH
STILL SLOW	1	0	0	④	The positions of STILL, SLOW or F-ADV.	STILL, SLOW, F-ADV
R. SLOW	1	0	1	⑤	R. SLOW, R. F. ADV	STILL R.SLOW R.F.ADV
REV	1	1	0	⑥	From REV direction Normal running mode	R-SEARCH R-PLAY

Main Mode Shifting Conditions


Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor
Power ON↔OFF when the cassette is inserted completely.
OFF
From PLAY to STOP
From FF/REW to STOP
ON
From SLOW to STOP (or STILL)
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔STILL
From STILL to R.F.ADV (R. SLOW)
From REW to R-SEARCH
From R-SEARCH to REW
From STILL to F.ADV (SLOW)
PLAY↔R-SEARCH
REV↔R.SLOW (R.PLAY) (STILL)

Low Active indication
1: Low
0: High

Table. 2-3-1.

(1) Switch component

The mode switch consists of FL START SWITCH for detecting the cassette ejection and insertion, and MECHANISM MODE SWITCH for detecting each mode position of the mechanism. As can be understood from Fig.2-3-1, the MECHANISM MODE SWITCH rotates in excess of 360 degrees. Therefore, the sensing of a signal from the MECHANISM MODE SWITCH is done by the leaf switch.

(2) Mechanism mode switch

The mechanism mode switch consists of four terminals, namely, COM, DATA1, DATA2, and DATA3. These are processed as 3-bit signals for discrimination of seven modes.

The MECHANISM MODE SWITCH is not interchangeable with the hitherto available black switch due to a change in its internal structure. Be sure therefore to use a blue switch.

2-3-3. CONSIDERATION TO FULL LOADING

① In the normal stop condition, the head drum is rotated to facilitate the start-up of the image at the time of playback, but it is conceivable that this is left undisturbed for an extended period of time. This may result in wear of the video head. For this reason, when five minutes elapse from the stop condition, the head drum stops rotating.

② To prevent the tape from being caught in the head drum due to dew forming, etc., the tape is housed in the unloaded cassette when turning the power off.

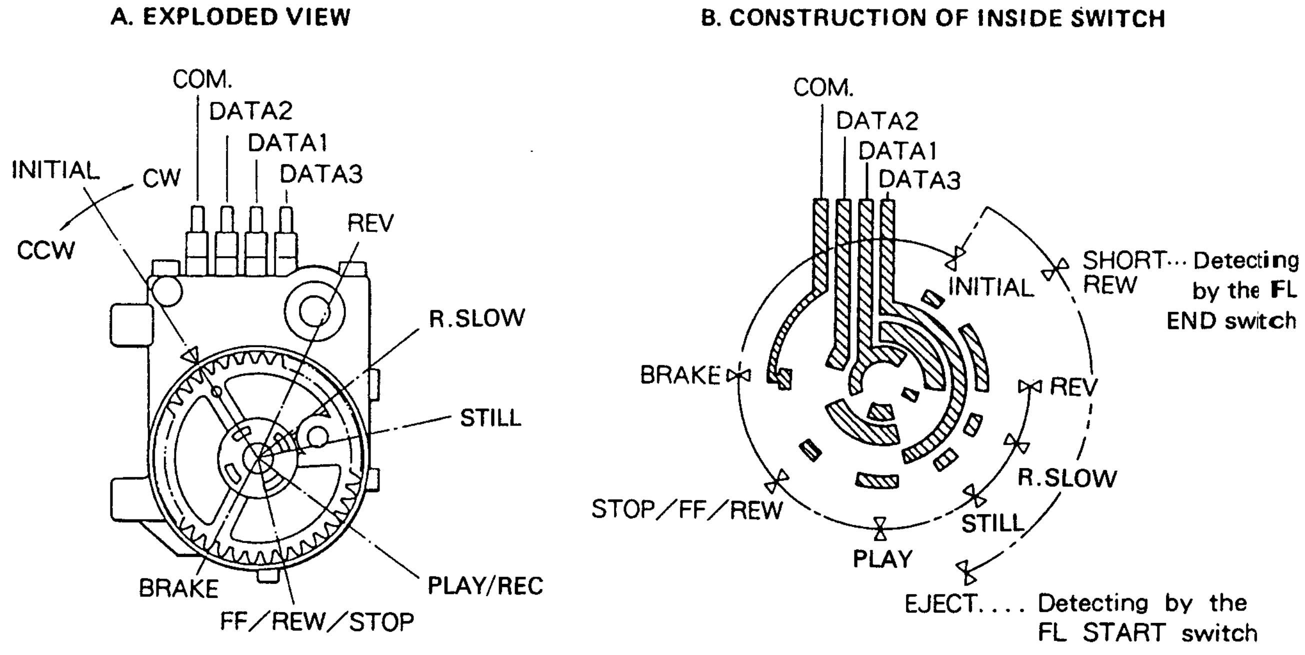

A. EXPLODED VIEW
COM.
DATA2
DATA1
INITIAL
CW
DATA3
CCW
REV
R.SLOW
STILL
BRAKE
PLAY/REC
FF/REW/STOP
B. CONSTRUCTION OF INSIDE SWITCH
COM.
DATA2
DATA1
DATA3
INITIAL
SHORT··· Detecting
REW
by the FL
END switch
BRAKE
REV
R.SLOW
STOP/FF/REW
STILL
PLAY
EJECT.... Detecting by the
FL START switch

Fig.2-3-1. **Mechanism Mode Switch (Rotary Switch)**

3.VIDEO CIRCUIT

3−1. Description

3−1−1. STRUCTURE

The video circuit consists of VP−1 and PC boards, The structures of the VP−1 and VD−1 boards are as follows:

VP−1

REC AMP CIRCUIT …… For Y−C MIX and recording current amplification.

PRE AMP CIRCUIT …… For preamplification and head SW envelope detection.

EQUALIZER CIRCUIT …… REC & PLAY equalizer.

VD−A

ON-SCREEN CIRCUIT …… For inserting characters.

LUMINANCE SIGNAL PROCESSING CIRCUIT …… For processing luminance signals.

CHROMA SIGNAL PROCESSING CIRCUIT …… For processing chroma signals.

INTERFACE CIRCUIT …… For interfacing with the system computer servo.

MODE POWER CIRCUIT …… For generating mode power.

The connections of the circuits are shown in the block diagram, Fig. 3−1.

3−2. Luminance Recording Process

A simplified block diagram for luminance recording process paths is shown in Fig. 3−2.

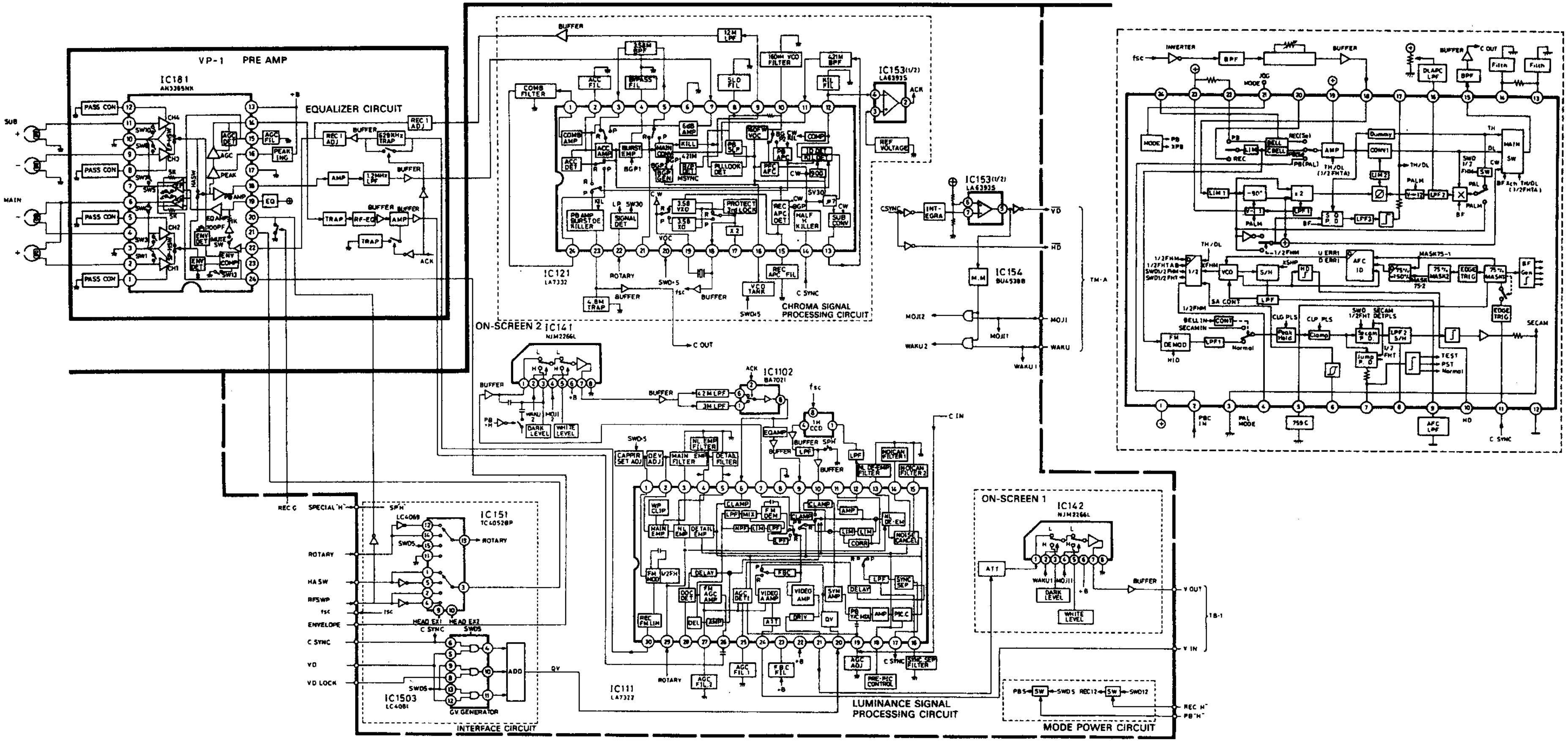

VP-1 PRE AMP
IC181
AN3385NK
SUB
MAIN
PASS CON
EQUALIZER CIRCUIT
REC 1 ADJ
BUFFER
629KHz TRAP
AMP
1.2MHz LPF
TRAP
RF-EQ
ACK
HASW
SW1
SW2
SW3
SW4
AGC
PEAK
PB AMP
ENV DET
ENV COMP
EQ
IC153(1/2)
LA6393S
ACK
REF VOLTAGE
COMB FILTER
ACC FIL
BPASS FIL
SLD FIL
160MH VCO FILTER
4.21M BPF
12M LPF
3.58M BPF
BUFFER
COMB AMP
ACC DET
ACC AMP
BURST EMP
KILL
VCO
PB APC
COMP
ID DET
PB AMP BURST DE KILLER
SIGNAL DET
3.58 VXO
PROTECT 3rd LOCK
REC APC DET
HALF H KILLER
SUB CONV
REC APC FIL
VCO TANK
IC121
LA7332
ROTARY
4.8M TRAP
BUFFER
SWD-5
C SYNC
C OUT
CHROMA SIGNAL PROCESSING CIRCUIT
IC153(1/2)
LA6393S
CSYNC
INT-EGRA
VD
HD
IC154
BU4538B
M.M
MOJI2
MOJI1
WAKU2
WAKU1
WAKU
TM-A
ON-SCREEN 2
IC141
NJM2266L
BUFFER
DARK LEVEL
WHITE LEVEL
IC1102
BA7021
4.2M LPF
3M LPF
fsc
1H CCD
C IN
EQAMP
BUFFER
SPH
LPF
NOCAN FILTER 1
NOCAN FILTER 2
NL DE-EMP FILTER
SWD-5
CAPPIR SET ADJ
DEV ADJ
MAIN EMP FILTER
NL EMP FILTER
DETAIL FILTER
WP CLIP
MAIN EMP
NL EMP
DETAIL EMP
CLAMP
LPF
MIX
FM DEM
LIM
NL DE-EM
NOISE CANCEL
FM MOD
DELAY
DOC DET
FM AGC AMP
AGC DET
VIDEO A.AMP
VIDEO AMP
SYN AMP
SYNC SEP
REC FM LIM
DEL
ATT
DRIV
QV
PB Y/C MIX
AMP
PB C
AGC ADJ
SYNC SEP FILTER
AGC FIL 2
AGC FIL 1
FBC FIL
PRE-PIC CONTROL
IC111
LA7322
LUMINANCE SIGNAL PROCESSING CIRCUIT
REC C
SPECIAL "H"
ROTARY
HA SW
RFSWP
fsc
ENVELOPE
C SYNC
VD
VD LOCK
IC151
TC4052BP
LC4069
SWD5
HEAD EX1
HEAD EX2
ADD
QV
IC1503
LC4081
QV GENERATOR
INTERFACE CIRCUIT
ON-SCREEN 1
IC142
NJM2266L
ATT
BUFFER
Y OUT
Y IN
TB-1
PBS
SW
SWD5
REC12
SWD12
REC "H"
PB "H"
MODE POWER CIRCUIT
INVERTER
fsc
BPF
BUFFER
C OUT
DLAPC LPF
Filter
JOG MODE
MODE
PB
REC(Se)
LIM
BELL
AMP
Dummy
CONV1
TH/DL
MAIN SW
LIM1
-90°
x2
LPF1
LPF2
LPF3
PALM
PAL
1/2FHM
VCO
S/H
U ERR1
D ERR1
AFC ID
MASK75-1
75%
EDGE TRIG
BF Gen
SA CONT
BELL IN
SECAM IN
FM DEMOD
CLG PLS
CLP PLS
Peak Hold
Clamp
SWD SECAM
Secam P.D
Jump P.D
TEST
PST
Normal
SECAM
PBC IN
PAL MODE
75SC
AFC LPF
HD
C SYNC

Fig. 3-1. Video Circuit Block Diagram

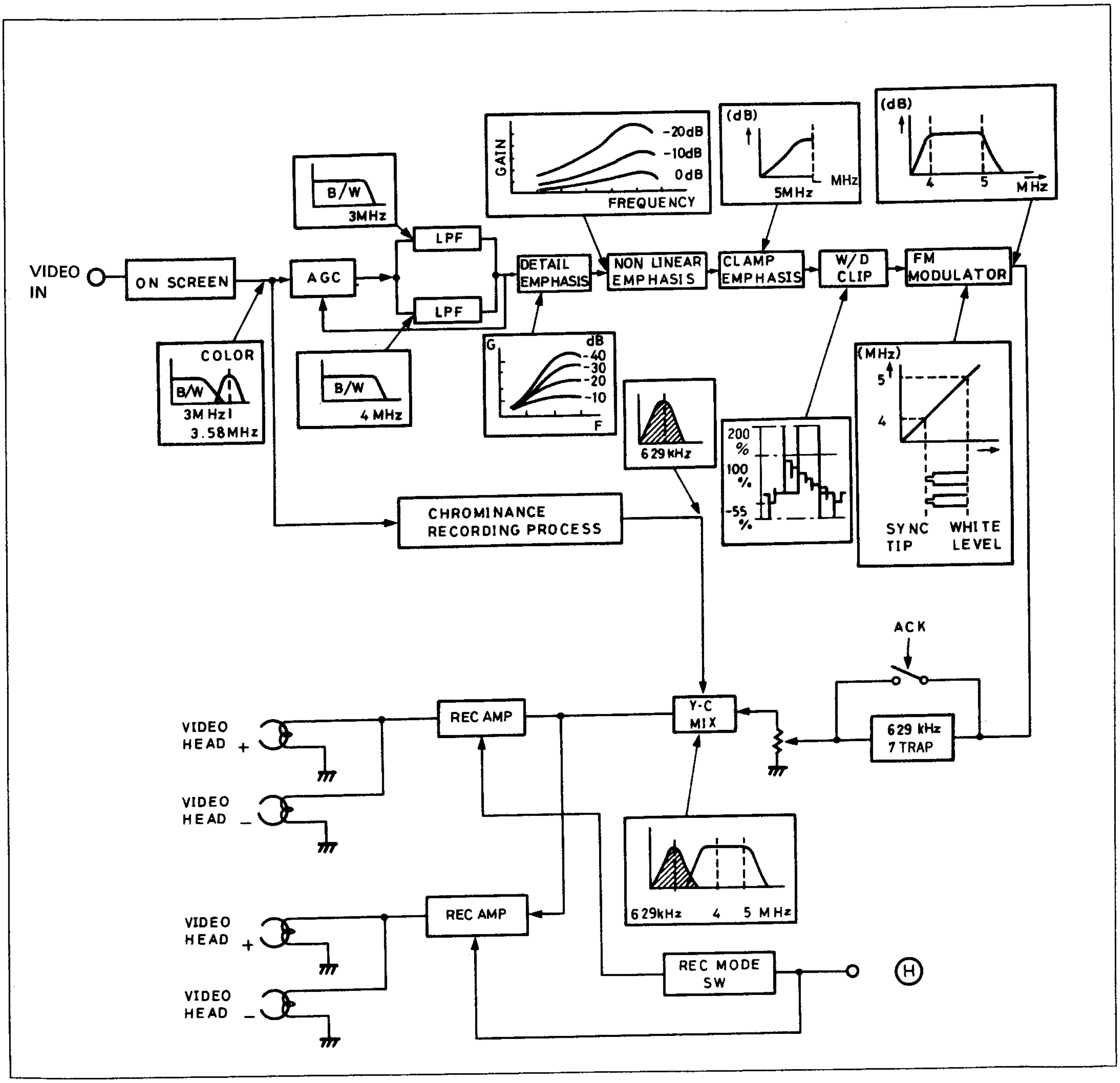

VIDEO IN
ON SCREEN
AGC
LPF
LPF
B/W
3MHz
B/W
4 MHz
COLOR
B/W
3M Hz
3.58MHz
DETAIL EMPHASIS
GAIN
-20dB
-10dB
0dB
FREQUENCY
G
dB
-40
-30
-20
-10
F
NON LINEAR EMPHASIS
CLAMP EMPHASIS
(dB)
5MHz
MHz
W/D CLIP
FM MODULATOR
(dB)
4
5
MHz
(MHz)
5
4
SYNC TIP
WHITE LEVEL
200 %
100 %
-55 %
629kHz
CHROMINANCE RECORDING PROCESS
ACK
Y-C MIX
629 kHz 7 TRAP
629kHz
4
5 MHz
REC AMP
REC AMP
REC MODE SW
H
VIDEO HEAD +
VIDEO HEAD −
VIDEO HEAD +
VIDEO HEAD −

Fig. 3-2. Luminance Recording Process Simplified Block Diagram

3-2-1. ON-SCREEN CIRCUIT

This circuit is to insert characters into incoming video signals.

It functions as follows:

The synchronizing/separating signals, HD and VD are sent to the character generator of TM-A, where they are used to generate characters, and the CO signal for the character part and the BLANK for trimming are output; the CO signal puts into 4 pin and the BLANK into 2 pin.

The voltage level for trimming can be controlled by the voltage of 3 pin; and so can the brightness of characters by the voltage of 5 pin.

The BLANK and CO signals and an inserted video signal are shown in Fig. 3-3.

Characters are inserted in AGC loop and output circuit.

① Characters inserted in output circuit
When front panel on-screen SW selects MONITOR. T/D code (Date. Day of the week, Hour, Minute, Second, Speed, Alarm count, AM/PM), mode, and counter figure are displayed.

② Characters inserted in AGC loop.
Only recorded characters are inserted.
Mode and counter figure are displayed at only the lower part of the screen, and the pulse at only the upper part of the screen made by M. M. and character signal are delivered into AND.
VD signal integrates No. 17 pin C. SYNC, and hysteresis comparator separates VD. M. M. is triggered by this VD to make the pulse of the first half of the screen.

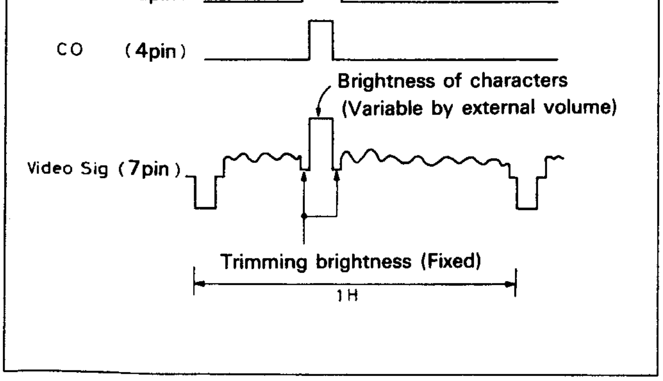

BLANK (2pin)
CO (4pin)
Brightness of characters (Variable by external volume)
Video Sig (7pin)
Trimming brightness (Fixed)
1H

Fig. 3-3. ON-SCREEN CIRCUIT OPERATION

3-2-2. AGC CIRCUIT

This circuit uses the following SYNC AGC and PEAK AGC:

SYNC AGC……Detects the amplitudes of synchronizing signals to equalize their levels.

PEAK AGC……Equalizes synthetic video signals in the case of particularly large video elements.

The block diagram of SYNC AGC is shown in Fig. 3-4. The output in the E-E mode is derived from 21 pin in this diagram.

3-2-3. Y SEPARATING CIRCUIT

The Y-signal separating circuit is located in the AGC LOOP, using two types of LPFs: one for color and the other W/B.

These LPFs are used for Y-signal separation in recording and done for eliminating FM carriers and duplex FM waves through demodulation in playback.

The characteristic drawings are show in Figs. 3-5 and 3-6. The effect in REC-EE is show in Fig. 3-7 and that in PLAY in) Fig. 3-8.

3-2-4. EMPHASIS

The emphasis is to reduce triangular noises caused by FM modulation. This circuit uses the following three types of emphasis:

1) MAIN EMPHASIS
With a purpose of improving the S/N ratio, applies emphasis uniformly independently of the signal level. (Fig. 3-9)
2) NON-LINEAR EMPHASIS
Emphasizes lower levels of signals further to suppress a high range of noises, improving the S/N ratio. (Fig. 3-10)
3) DETAIL EMPHASIS
Serves to improve the reproducibility of image details by previously emphasizing, in recording, small amplitudes of video signals that are likely to be lost in playback.
The block diagram is shown in Fig. 3-11 and the characteristic drawing in Fig. 3-12.
This circuit is shared with the LINE NOICAN (NOISE CANCELER) in playback.

3-2-5. HALF-H SHIFT

When the Y signal is frequency modulated, the interference of the head reduced by shifting the frequency by 1/2 fH=7.867 KHz between (-) and (+) azimuth sides.

For example, as shown in Fig. 3-13, the energy elements from the side band of the (+) track stretch at intervals of fHs; if the carrier frequency of the (-) track is enhanced by 1/2 fH, the energy elements from the side band of the (-) track will be distributed intermediately to the (+) track distribution without overlapping it, thus much preventing interference of the head from occurring.

In this equipment, 1/2 fH potential differences are provided with signals for each track at the preceding stage to the FM modulation.

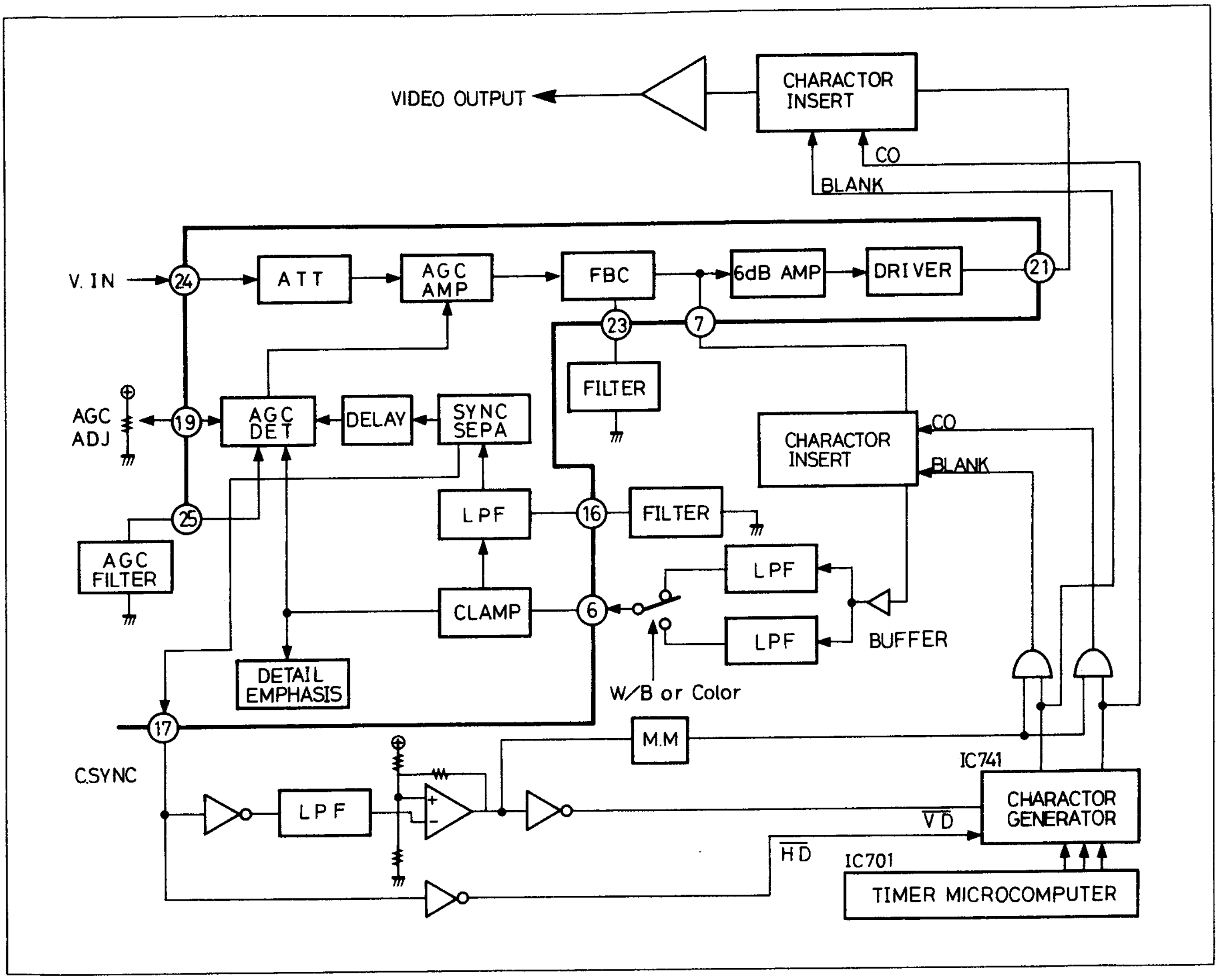

VIDEO OUTPUT
CHARACTOR INSERT
CO
BLANK
V. IN
24
ATT
AGC AMP
FBC
6dB AMP
DRIVER
21
23
7
FILTER
AGC ADJ
19
AGC DET
DELAY
SYNC SEPA
CHARACTOR INSERT
CO
BLANK
25
LPF
16
FILTER
AGC FILTER
CLAMP
6
LPF
LPF
BUFFER
DETAIL EMPHASIS
W/B or Color
17
M.M
C.SYNC
IC741
LPF
CHARACTOR GENERATOR
VD
HD
IC701
TIMER MICROCOMPUTER

Fig. 3-4. AGC BLOCK Diaglam

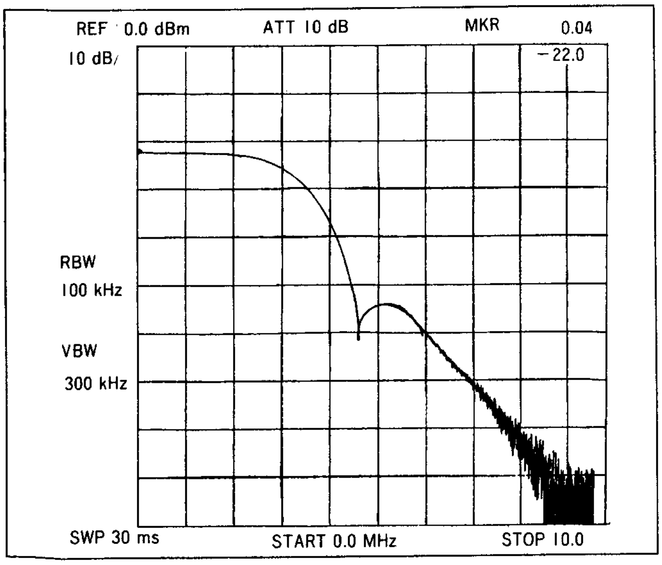


Fig. 3-5. LPF (color Mode)

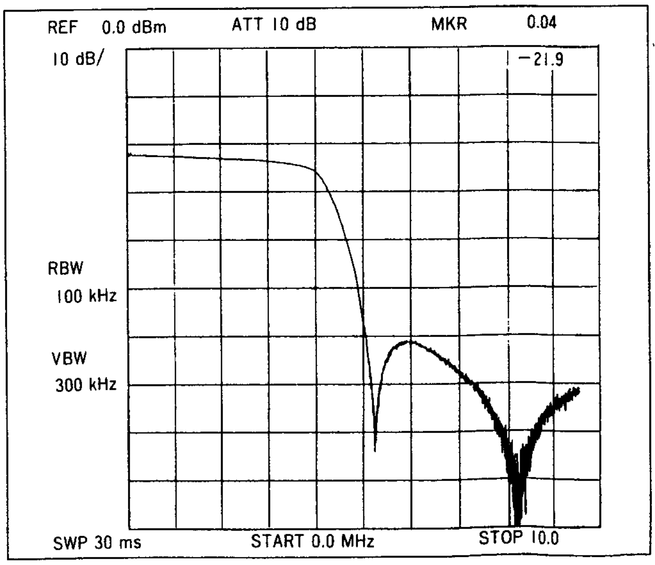


Fig. 3-6. LPF (W/B Mode)

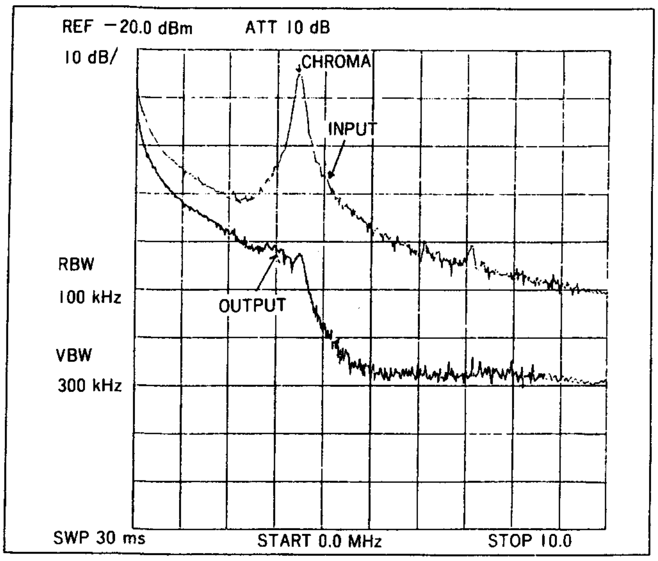


Fig. 3−7. 2.8MHz LPF EFFECT REC. EE MODE (color Bar Signal)

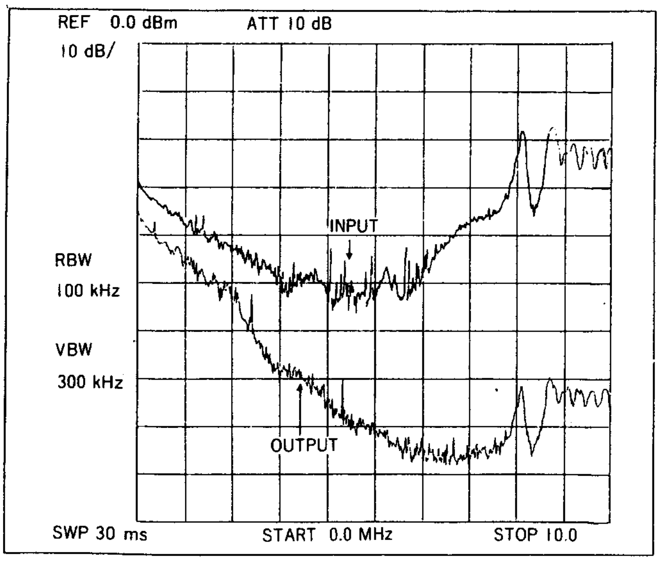


Fig. 3−8. 2.8MHz LPF EFFECT PLAY BACK MODE (color Bar Signal)

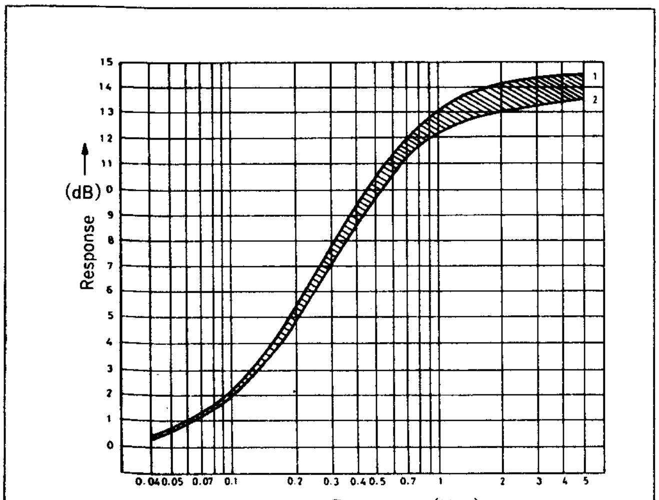


Fig. 3−9. MAIN EMPHASIS

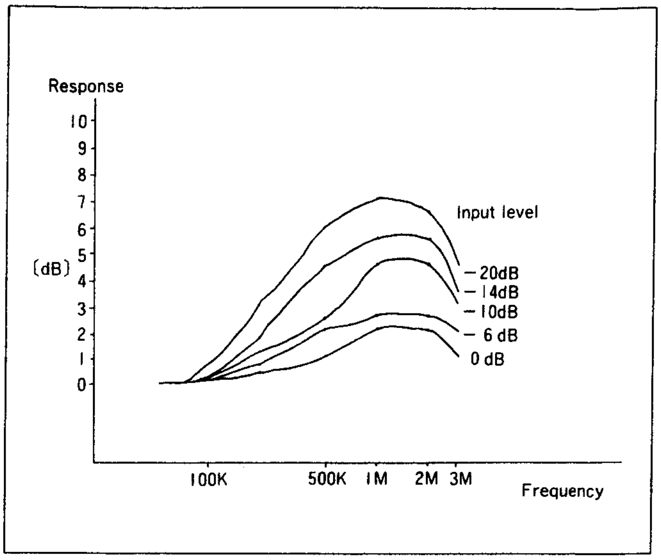
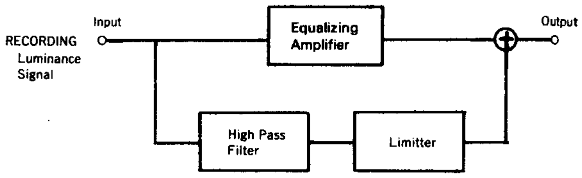


Fig. 3−10. Response characteristics of Non-linear Emphasis

Basic Block Diagram


Input
RECORDING
Luminance
Signal
Equalizing
Amplifier
Output
High Pass
Filter
Limitter

Characteristics

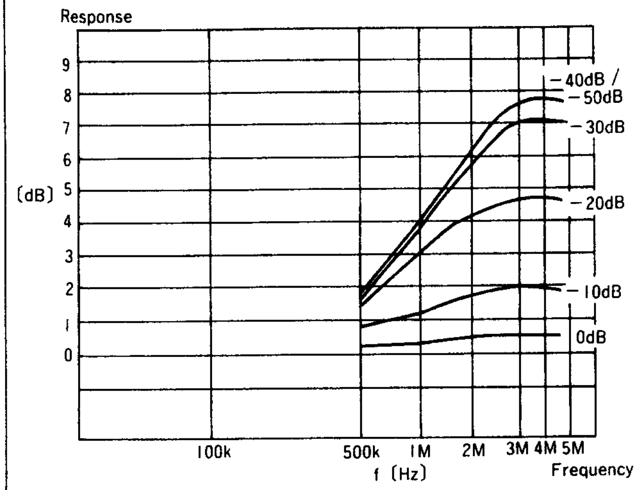
Emphasis ratio : 8 dB or less

Amount of emphasis : 10 IRE or less

Operating frequency : 1 MHz or more

(Measured at a level lower than 40 dB with a frequency resulting in an emphasis ratio of 1/2.)

Fig. 3−11. Basic Block Diagram



Emphasis ratio : 8dB
Amount of emphasis : 10 IRE
Operating frequency : 4dB/1 MHz

Fig. 3−12. Responce characteristics of Detail Enhancer (Example)

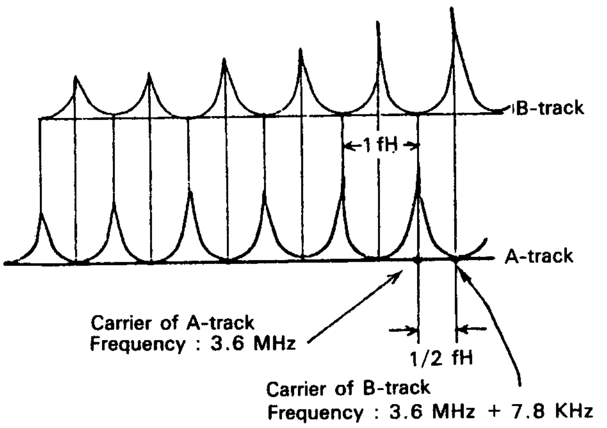


Fig. 3−13. Distribution in side bands of A- and B-tracks with 1/2 fH shifitng.

3−2−6. WHITE/DARK CLIP

As a result of the pre-emphasis that emphasizes the high band, some overshoots and undershoots occur. Applying them to the FM modulator as they are will cause such extremely high or low frequencies that the FM modulated carrier exceeds the specified frequency deviation. This is the reason the white clip and dark clip are involved in, which serve to clip higher levels of frequencies than required.
In this equipment, the white clip is set at approx. 200% and the dark clip at approx. 55%. (Fig. 3−14)

This IC has the white and dark clips whose levels are fixed internally; the clip level can be changed by changing the input (6 pin) level. To raise the clip level, lower the input; to lower the level, raise the input.

3−2−7. FM MODULATION

This equipment is specified for the FM modulation with a deviation of 1.1 MHz and an allocation of 4 M to 5.1 MHz, which are used as a High-Band whose allocation is shifted 600 KHz higher than normal VHSs. (Fig. 3−15)

3−2−8. TRAP CIRCUIT

This circuit is trapped in the color mode so that the lower sideband wave may not interfere with the low-band-conversion chroma signal in the color mode. With the W/B mode, the trap circuit is designed to enable even the use of the band for the low-band-conversion chroma signal so as to enhance the resolution of the W/B. (Fig. 3−16)
A color bar signal spectrum for FM modulation and that after a trap are shown in Fig. 3−17.

3−2−9. REC AMP CIRCUIT

This circuit performs recording by mixing the Y-FM signal and C-low-band conversion signal and passing them through the amplifier.
The characteristics of recording current are shown in Fig. 3−18.
The recording current spectrum for the color bar is shown in Fig. 3−19.

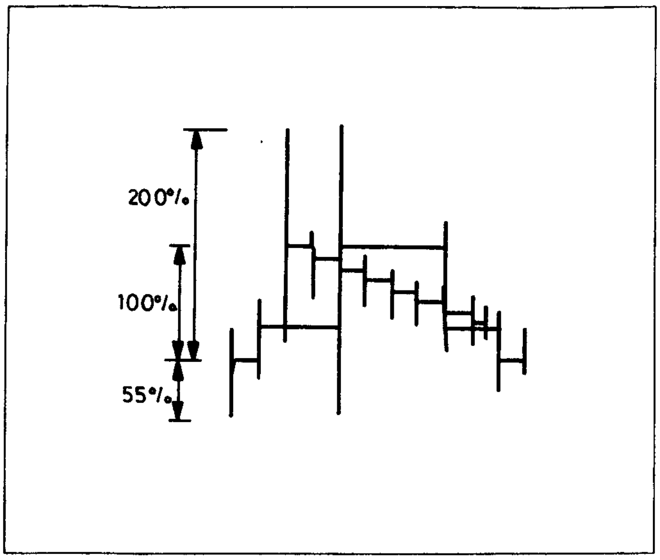


Fig. 3-14. White/Dark Clip

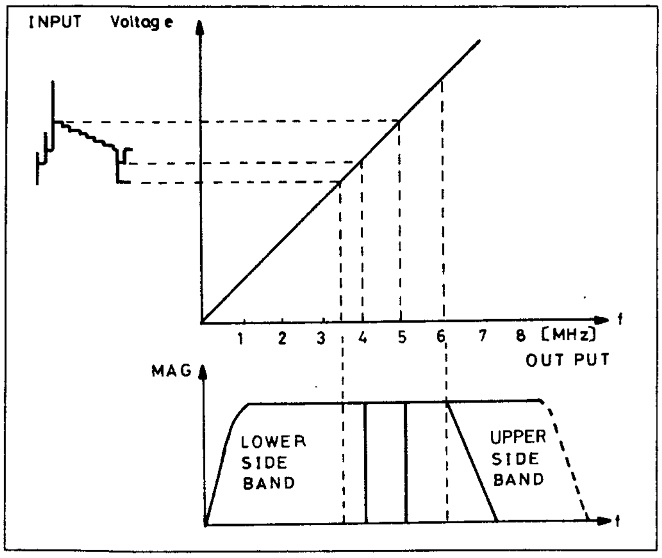

INPUT Voltage
1
2
3
4
5
6
7
8 [MHz]
f
OUT PUT
MAG
LOWER SIDE BAND
UPPER SIDE BAND
f

Fig. 3-15. FM Frequency Alocation

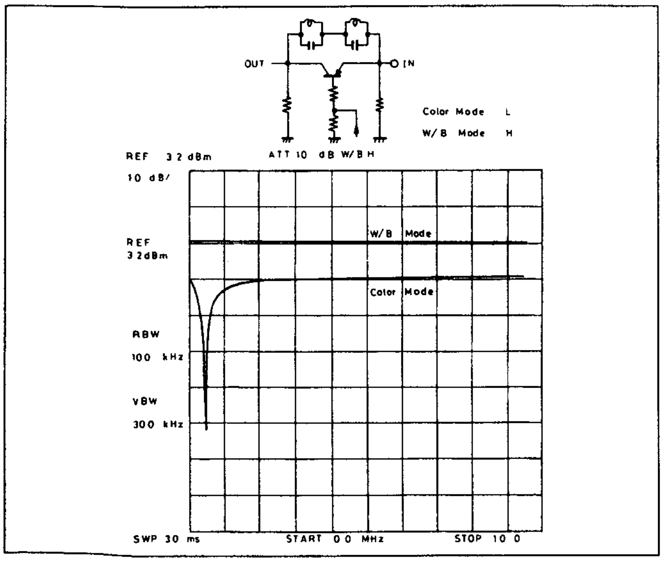


Fig. 3-16. Characteristics of Trap

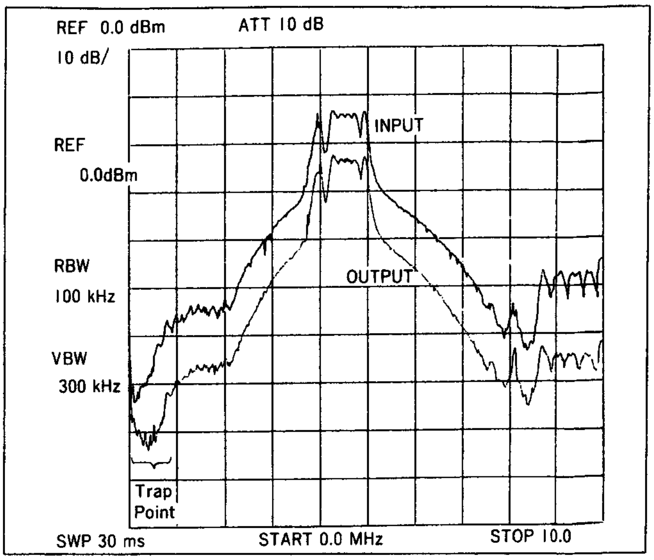


Fig. 3-17. TRAP EFFECT Color Bar Signal SPECTRUM

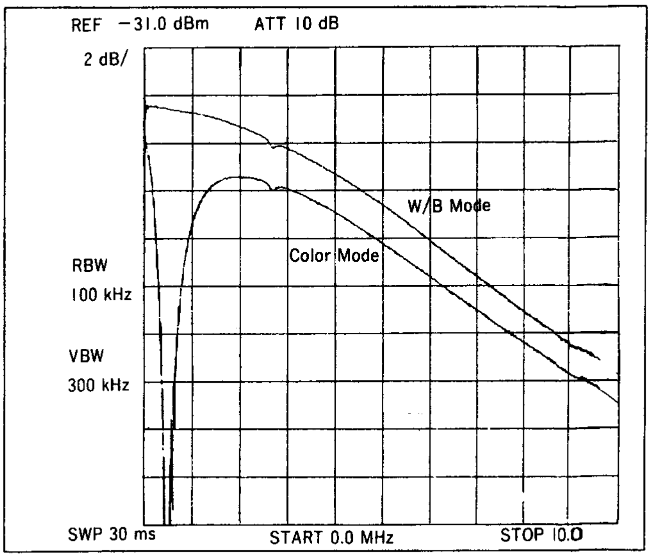


Fig. 3-18. REC AMP Characteristics

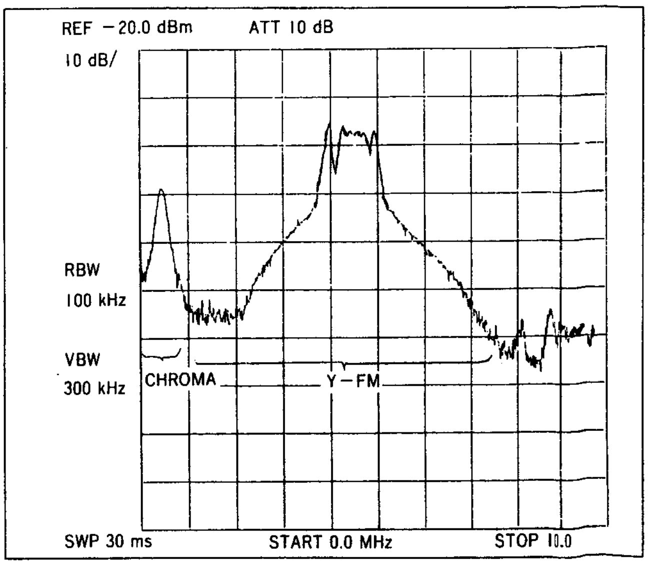


Fig. 3-19. Recording Current Spectrum (For Color Bar)

3－3. Luminance Signal Playback Process

A simplified block diagram for the playback process of the luminance signal is shown in Fig. 3－20.

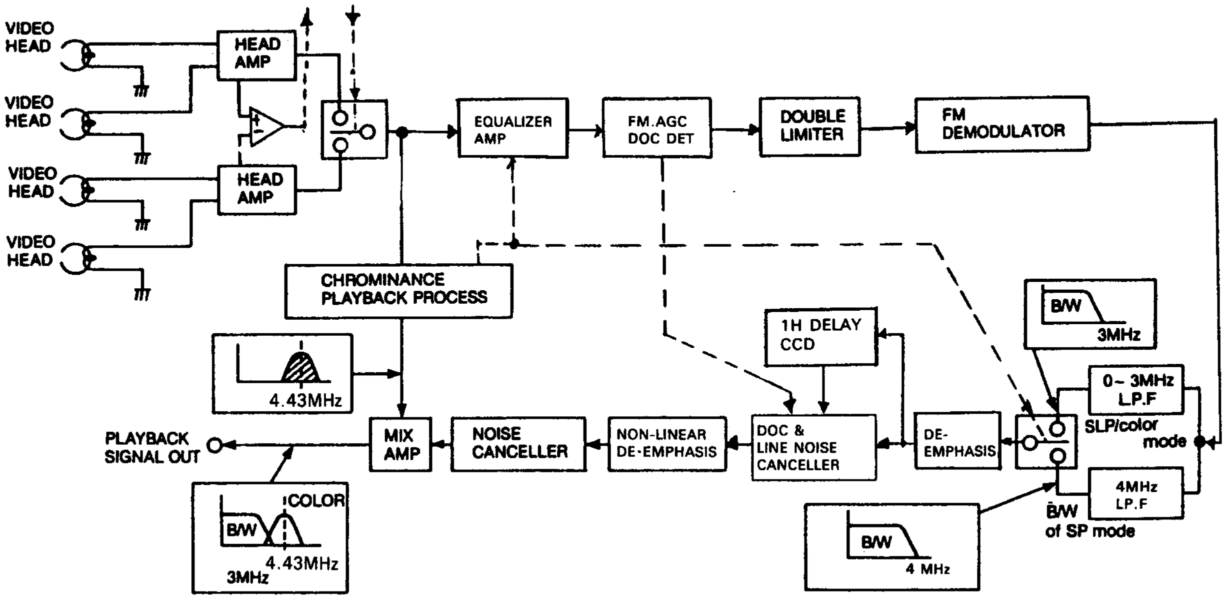
3－3－1. PREAMP CIRCUIT

This PREAMP circuit amplifies the pickup signal at the head by approx. 59 dB and also yields output as switching over the (＋) and (－) head outputs.
In serching and 12H, 24H, REVERSE PLAYs, the circuit compares the envelope outputs of the SUB Head Amp with those of the MAIN Head Amp so as to prefer the larger output for switching.
The envelope detection output is once transmitted to the servo circuit, where the Head Amp SW signal is generated depending on the mode and transmitted to the PRE AMP.

The selection of the head depending on the control signal is shown in Table 3－2.

Envelope Output 24 pin	SWP 2 pin	HA-SW 21 pin
MAIN (－)	L	L
MAIN (＋)	H	L
SUB (－)	L	H
SUB (＋)	H	H

Table 3－2. Head Selection



VIDEO HEAD
VIDEO HEAD
VIDEO HEAD
VIDEO HEAD
HEAD AMP
HEAD AMP
EQUALIZER AMP
FM.AGC DOC DET
DOUBLE LIMITER
FM DEMODULATOR
CHROMINANCE PLAYBACK PROCESS
4.43MHz
1H DELAY CCD
B/W
3MHz
0～3MHz LP.F
SLP/color mode
4MHz LP.F
B/W of SP mode
B/W
4 MHz
DE-EMPHASIS
DOC & LINE NOISE CANCELLER
NON-LINEAR DE-EMPHASIS
NOISE CANCELLER
MIX AMP
PLAYBACK SIGNAL OUT
COLOR
B/W
4.43MHz
3MHz

Fig 3－20. Luminance Playback Process Simplified Block Diagram

3-3-2. EQUALIZER CIRCUIT

This circuit performs the phase compensation of the playback FM signal, the band amplification, and the filter switching between the W/B and color modes. (Fig.3-21)

Figs.3-22 and 3-23 shows the equalizer characteristics of sweep signals in the W/B and color modes.

In the W/B mode, Q1807 turns ON, making the Trap ineffective.

In the color mode, Q1807 turns OFF, making the Trap effective.

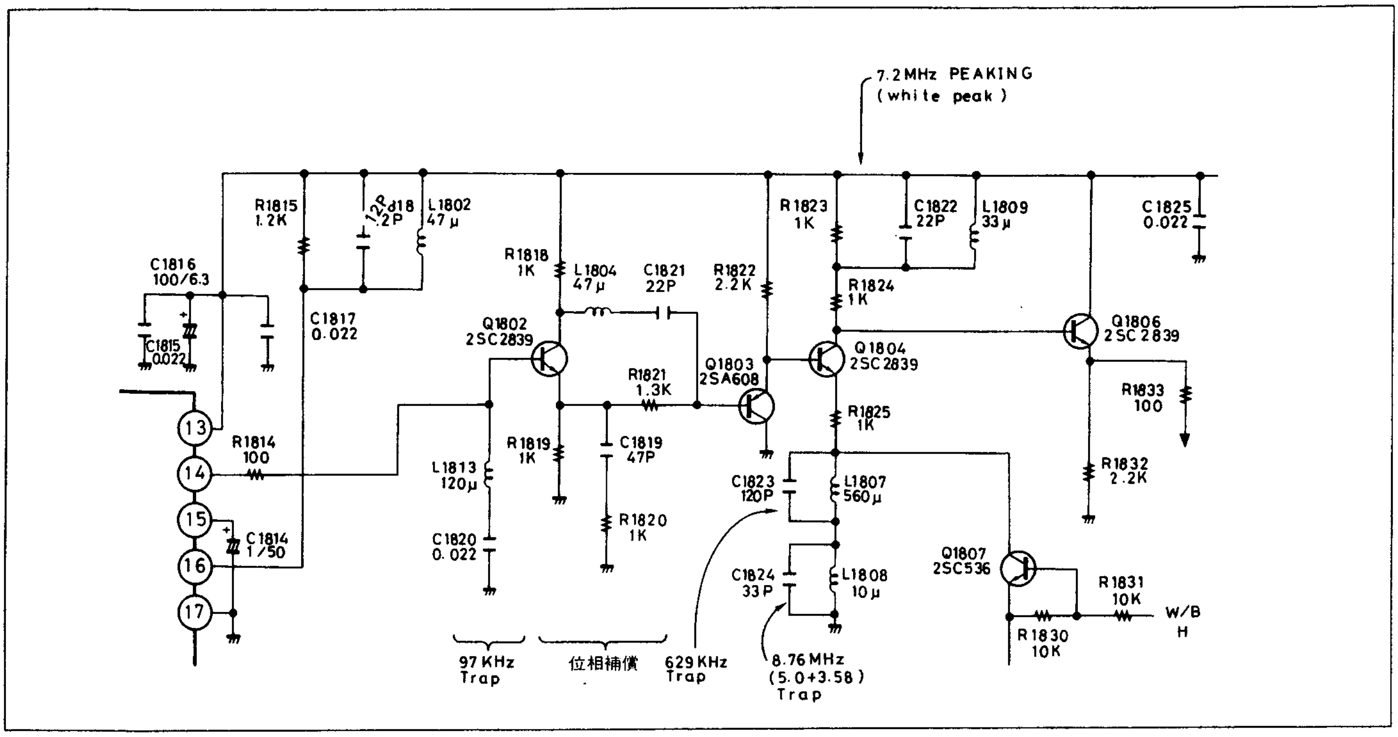

7.2MHz PEAKING
(white peak)
R1815 1.2K
C1818 12P
L1802 47μ
C1816 100/6.3
C1815 0.022
C1817 0.022
R1818 1K
L1804 47μ
C1821 22P
R1822 2.2K
Q1802 2SC2839
R1821 1.3K
Q1803 2SA608
R1823 1K
C1822 22P
L1809 33μ
R1824 1K
Q1804 2SC2839
C1825 0.022
Q1806 2SC2839
R1833 100
R1825 1K
R1832 2.2K
13
14
15
16
17
R1814 100
C1814 1/50
L1813 120μ
C1820 0.022
R1819 1K
C1819 47P
R1820 1K
C1823 120P
L1807 560μ
C1824 33P
L1808 10μ
Q1807 2SC536
R1831 10K
R1830 10K
W/B H
97KHz Trap
位相補償
629KHz Trap
8.76MHz (5.0+3.58) Trap

Fig 3-21. EQUALIZER AMP

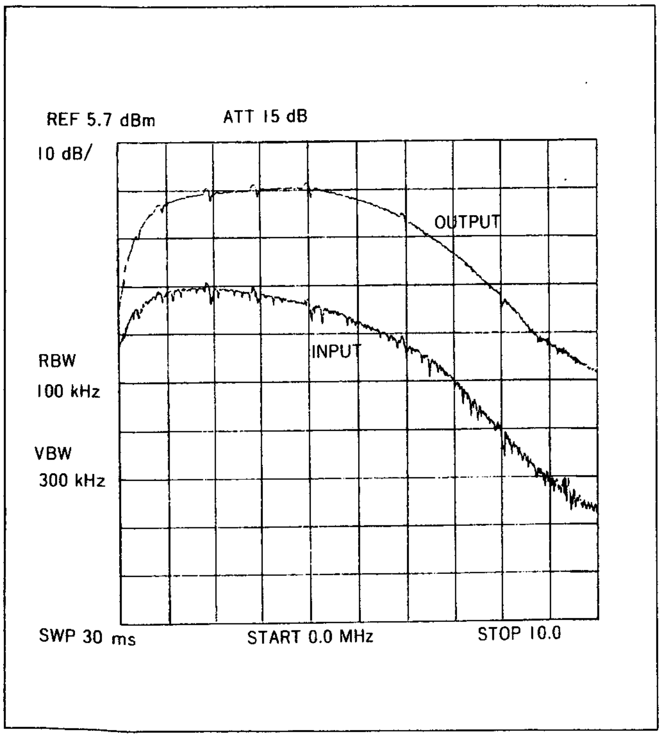


Fig 3-22. EQUALIZER EFFECT (W/B Mode)

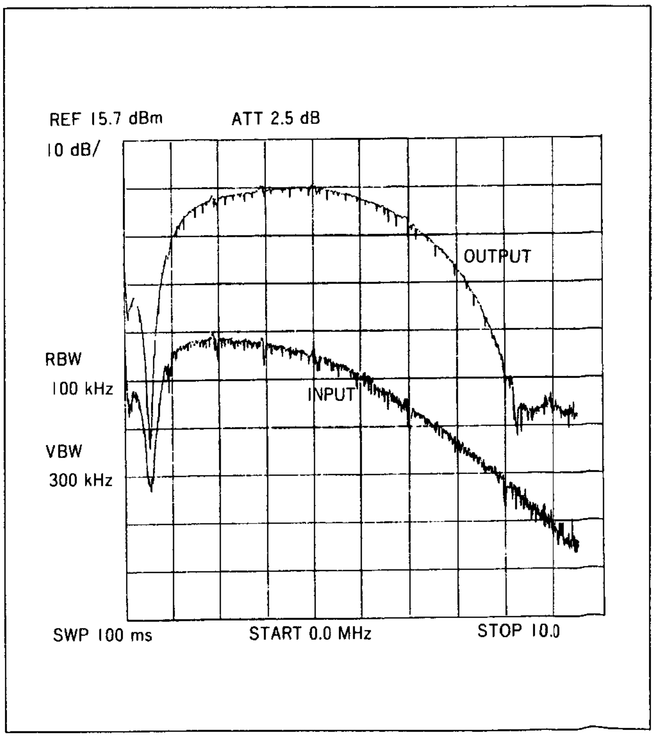


Fig 3-23. EQUALIZER EFFECT (Color Mode)

3-3-3. FM-AGC

The FM-AGC is to equalize the levels of the input playback FM signals; its I/O characteristics are shown in Fig. 3-24.
This circuit detects the signals as Drop Outs for not-more than 5 mV p-p ones.

3-3-4. DOUBLE LIMITTER

Fig. 3-25, a block diagram of the Double Limitter circuit, shows the waveforms of troughs.
This circuit divides the FM signal with the LPF and HPF to pass the output of the HPF, primarily carrier elements, through the Limitter and then, with the output of the LPF, primarily side band elements, added to this, again pass the Limitter, thereby demodulating to a video signal. Fig. 3-26 shows the characteristics of the LPF and HPF.
The Double Limitter circuit has the most effects on the inversion. The FM signal waveform on the occurrence of this inversion, as shown in Fig. 3-26, abruptly lowers in its level as the FM frequency abruptly rises against the rise-up to the white, resulting in false output of the Limitter. However, the Double Limitter, if used, serves to subject the carrier, whose low-band elements have once eliminated, to the Limitter, as show in Fig. 3-25, to recover the collapse and then mix the low band, preventing inversion from occurring.

3-3-5. FM DEMOD

The FM DEMOD is a circuit that converts FM signals to video signals; its FM DEMOD characteristics are shown in Fig. 3-27.

3-3-6. DE-EMPHASIS

This circuit is to return back the high band of the frequencies raised by the emphasis made in recording through de-emphasis. Its Characteristics are shown Fig. 3-28.

3-3-7. LINE NOISE CANCELLER

This circuit is to make differences between the 1H DELAY signal and existing signal by means of the line correlation of video signals, and to subject them to the Limitter to sweep the existing signal, thereby eliminating noises not having line correlation.
Moreover, the 1H DELAY signal is replaced with the existing signal through the Drop Out signal, thus used to carry out the Drop-Out compensation, where the 1H DELAY is provided with the clock with 2 fsc. (Fig. 3-29)
The B1601, turned ON for the special playback, mutes the 1H DELAY signal with the length of 1H changed, preventing the profiles of the image from doubling. For this reason, on the special playback, the LINE NOICAN is turned off and the high-band F special extended.

3-3-8. NON-LINEAR DE EMPHASIS

This circuit is to recover the non-linear emphasis made in recording; its characteristics are shown in Fig. 3-30.

3-3-9. NOISE CANCELLER

The structure of the NOISE CANCELLER and its signal are shown in Fig. 3-31. This circuit is to apply the Limitter so as to suppress high-band noise elements with additions in reverse phases. Its characteristics are shown in Fig. 3-32.

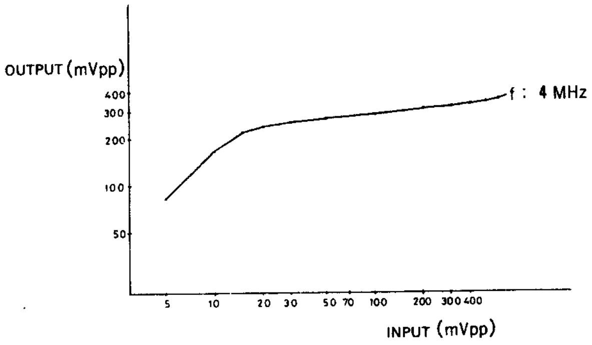


Fig.3-24. LA7322 FM AGC I/O Characteristics

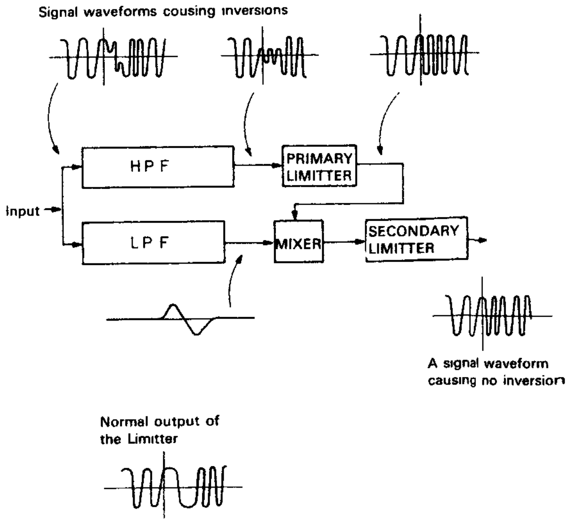

Signal waveforms cousing inversions
HPF
PRIMARY LIMITTER
Input
LPF
MIXER
SECONDARY LIMITTER
A signal waveform causing no inversion
Normal output of the Limitter

Fig.3-25. Signal Waveforms Causing Inversions and DL-FM Circuit

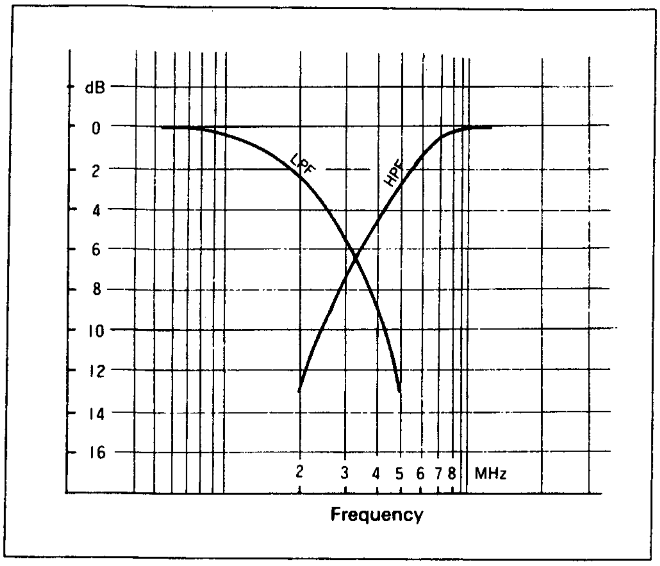


Fig. 3−26. Characteristics of DL-FM Circuit Filter

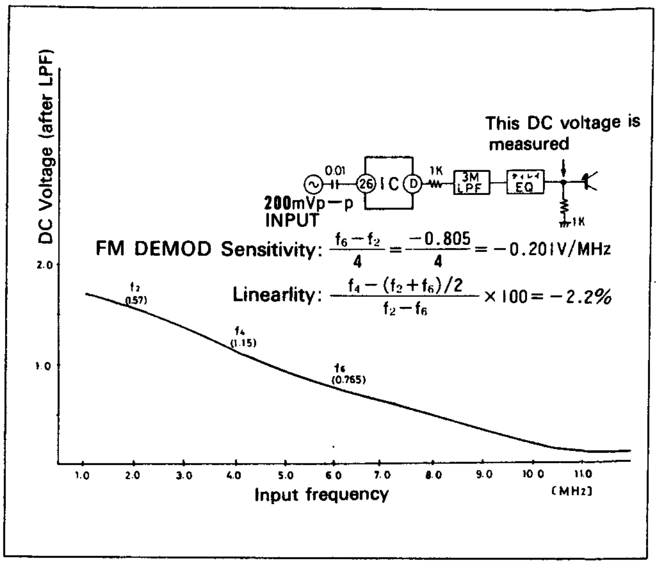


Fig. 3−27. LA7322 FM DEMOD Characteristics

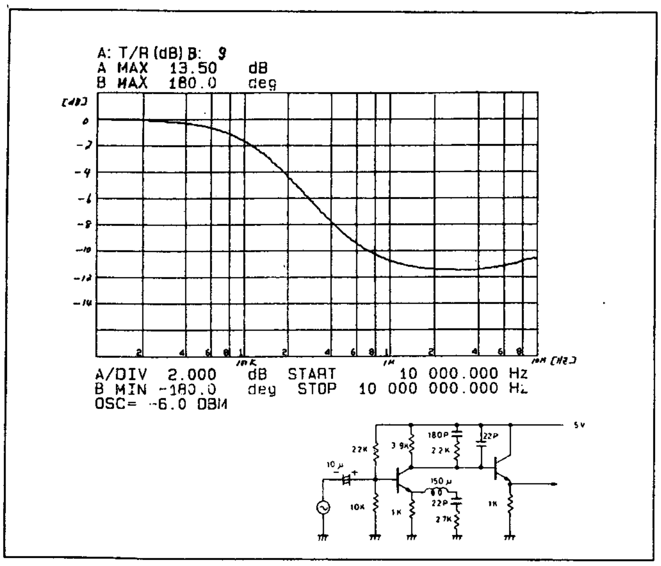


Fig. 3−28. MAIN DE-EMPHASIS

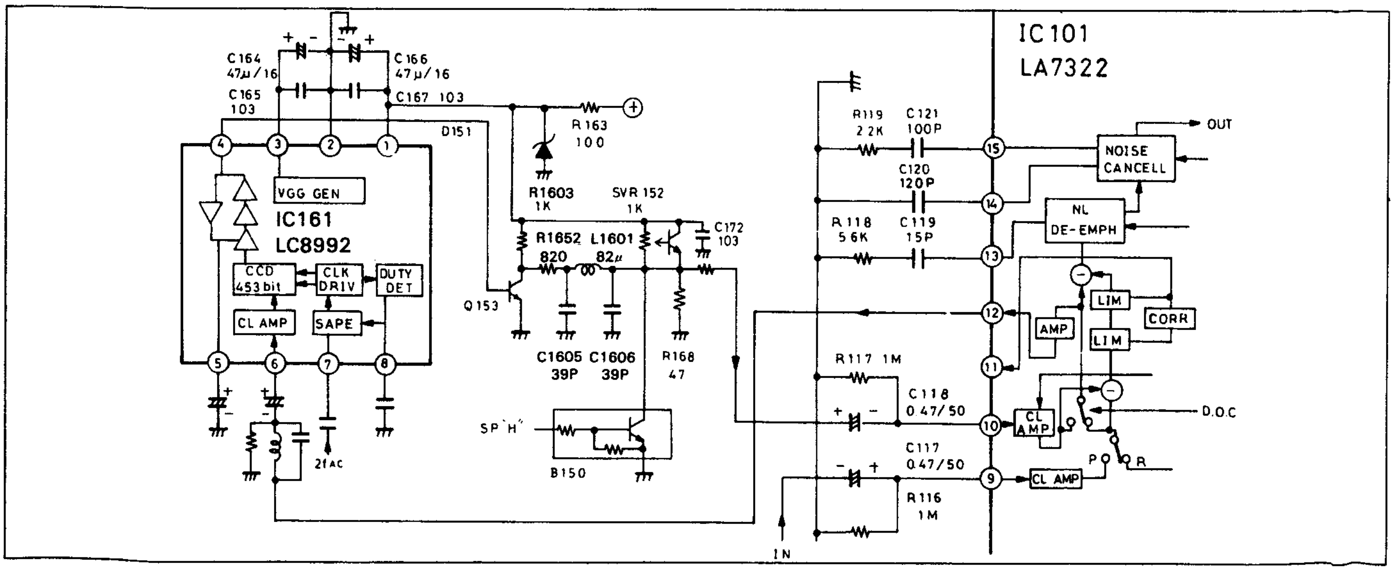

C164 47μ/16
C165 103
C166 47μ/16
C167 103
D151
R163 100
IC161
LC8992
VGG GEN
CCD 453 bit
CLK DRIV
DUTY DET
CL AMP
SAPE
R1603 1K
SVR 152 1K
R1652 820
L1601 82μ
C172 103
Q153
C1605 39P
C1606 39P
R168 47
SP"H"
B150
21AC
IC101
LA7322
R119 2.2K
C121 100P
C120 120P
R118 5.6K
C119 15P
R117 1M
C118 0.47/50
C117 0.47/50
R116 1M
NOISE CANCELL
NL DE-EMPH
LIM
AMP
CORR
LIM
CL AMP
CL AMP
OUT
D.O.C
P
R
IN

Fig. 3−29. LINE NOISE CANCELLER

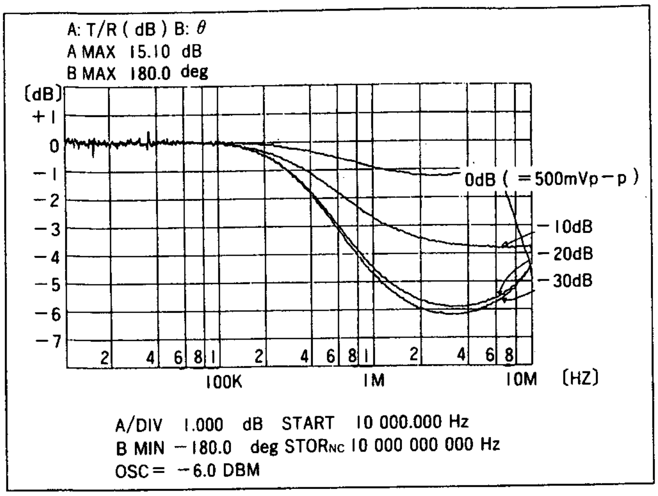


Fig. 3−30. LA7322 DYNAMIC DE-EMPHASIS

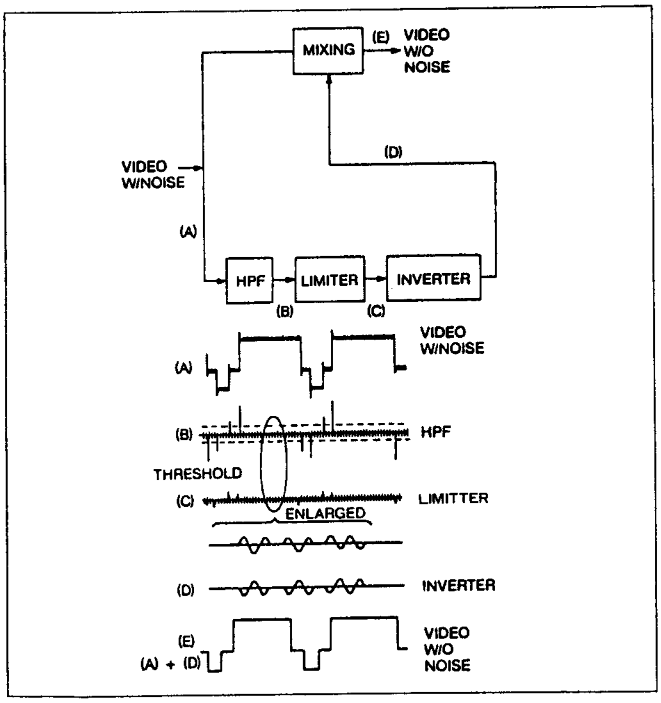

MIXING
(E) VIDEO W/O NOISE
(D)
VIDEO W/NOISE
(A)
HPF
LIMITER
INVERTER
(B)
(C)
(A)
VIDEO W/NOISE
(B)
HPF
THRESHOLD
(C)
LIMITTER
ENLARGED
(D)
INVERTER
(E)
(A) + (D)
VIDEO W/O NOISE

Fig 3−31. Noise Canceller Block Diagram

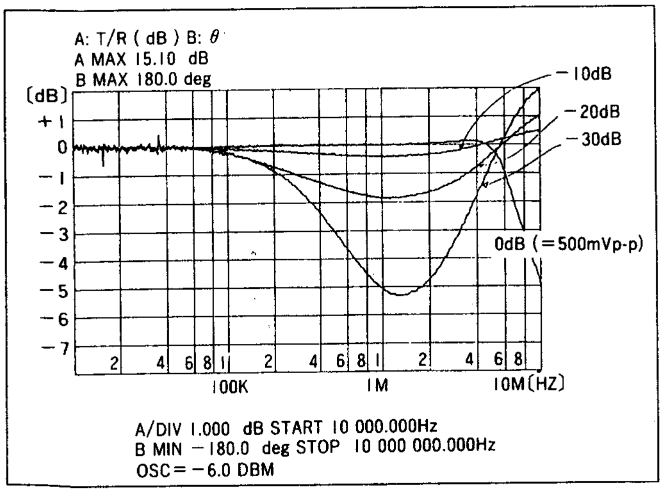


Fig. 3−32. LA7322 HIGH PASS N. C.

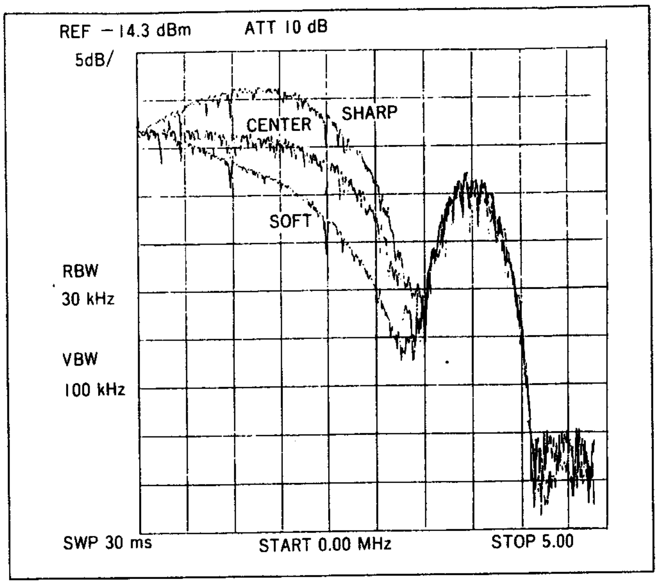


Fig. 3−33. PICTURE CONTROL (color)

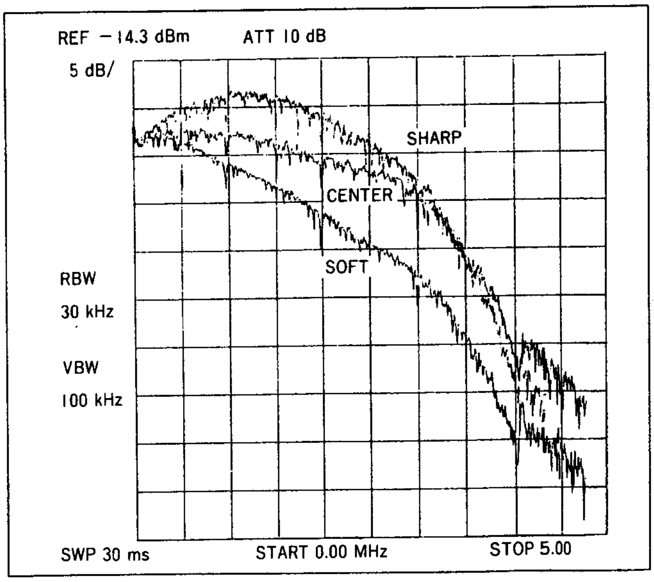


Fig. 3−34. PICTURE CONTROL (W/B)

3−4. Chroma signal Recording Process

The chroma signal recording process is shown in a simplified diagram, Fig. 3−35.

3−4−1. 4.43 MHz BPF

This BPF is intended to pick up only the chroma signal of 4.43 ± 0.5 MHz. Fig. 3−36 shows the BPF characteristics. Because the BPFs are used in both recording and playback in common, they are requierd to have both characteristics of recording and playback.

Function in recording: To pick up only the chroma signal from the video signal. Fig. 3−37 shows its I/O spectrum.

Chroma signal process

REC mode

To clarify main flow of in signals REC mode, simplified block diagram of chroma signal recording process is shown in Fig. 3−36. below.
Composite video signal to be recorded is applied to ㉑ PIN and two−thirds of the original signal is output from ⑤PIN and is directed to BPF (4.43MHZ). Then only chroma signal is extracted to be applied to ③ PIN. The signal applied to ③ PIN is directed to ACC'd Amp. Gain control of the ACC'd Amp. is made by DC voltage.

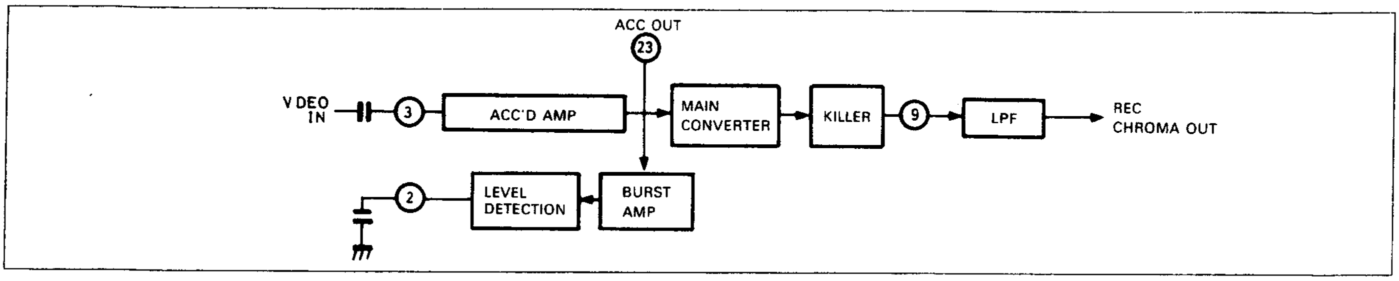

ACC OUT
23
V DEO IN
3
ACC'D AMP
MAIN CONVERTER
KILLER
9
LPF
REC CHROMA OUT
2
LEVEL DETECTION
BURST AMP

Fig. 3−35. Signal flow in REC mode

Output of ACC'd Amp. is provided in ㉓ PIN and is also induced to the main converter to be used as discriminant signal.
The other output is induced to level detection (ACC DET) by way of burst Amp.
The output is smoothed by filter condenser attached to ② PIN, and is fed back to ACC'd Amp. to keep output burst level of ACC'd Amp. constant.
As the result, the level of burst signal by way of burst emphasis circuit and main converter is kept constant, too. Then REC chroma current is kept constant, even if input level is changed, when the output of main converter is directed to LPF through ⑨ PIN, it turns to be REC chroma signal.

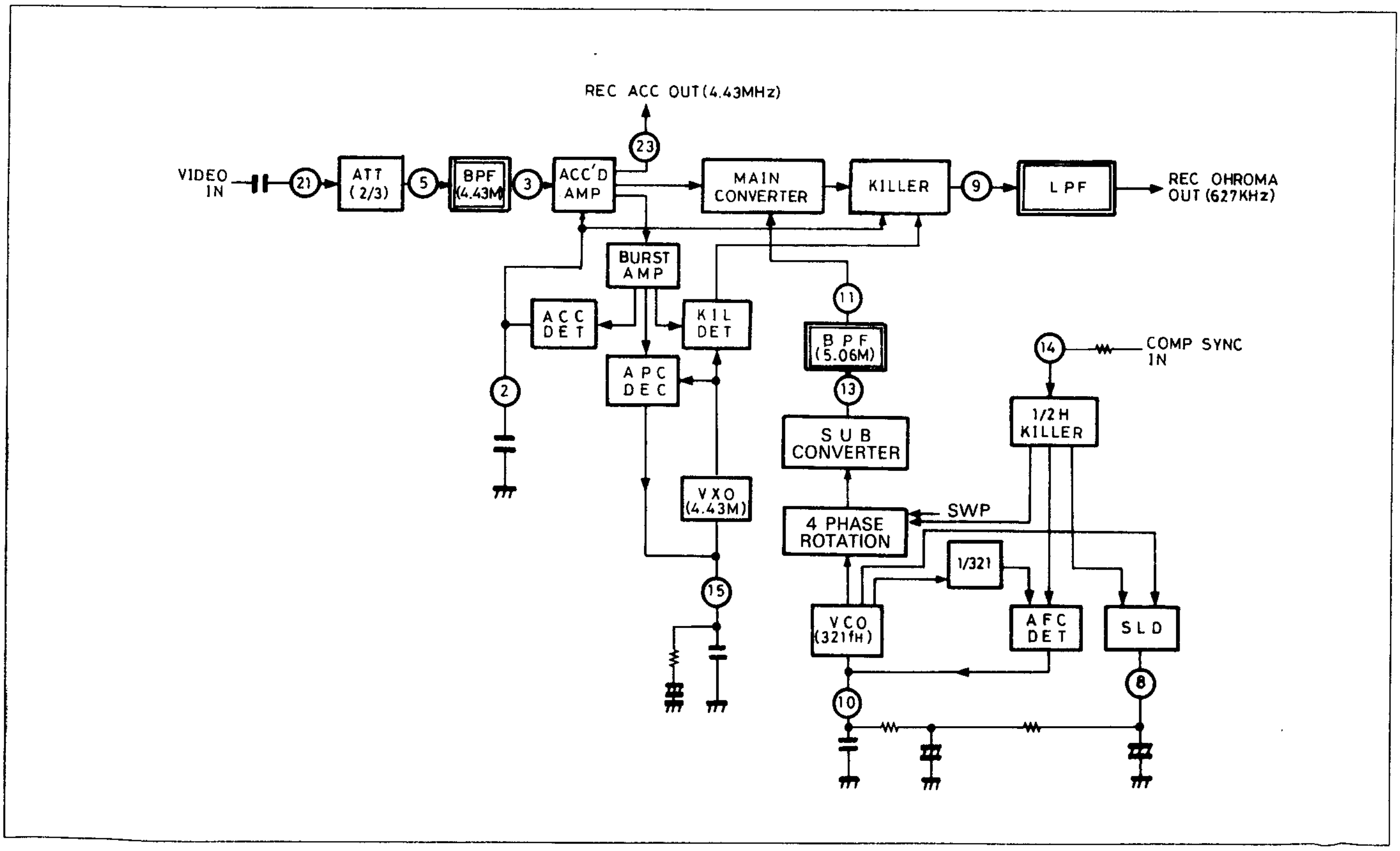

REC ACC OUT(4.43MHz)
23
VIDEO IN
21
ATT (2/3)
5
BPF (4.43M)
3
ACC'D AMP
MAIN CONVERTER
KILLER
9
L PF
REC OHROMA OUT (627KHz)
BURST AMP
ACC DET
KIL DET
APC DEC
2
VXO (4.43M)
15
11
BPF (5.06M)
13
SUB CONVERTER
4 PHASE ROTATION
SWP
14
COMP SYNC IN
1/2H KILLER
1/321
VCO (321fH)
AFC DET
SLD
10
8

Fig 3−36. Chrominance Recording Process Block Diagram (REC Mode)

3−4−2. APC circuit

Burst phase is inverted every H (±45°). If phase detection is made in the same way as NTSC, A.P.C. error voltage in every H becomes bigger and time constant must be longer. Then as showed in the Fig. 37, in this circuit CW signal from XO is switched every H to the shifted signal by 90 degrees so that phase diggerence between CW signal and burst signal is always kept to 90 degrees.
(Fig. 38−6)······It is available during PB only.

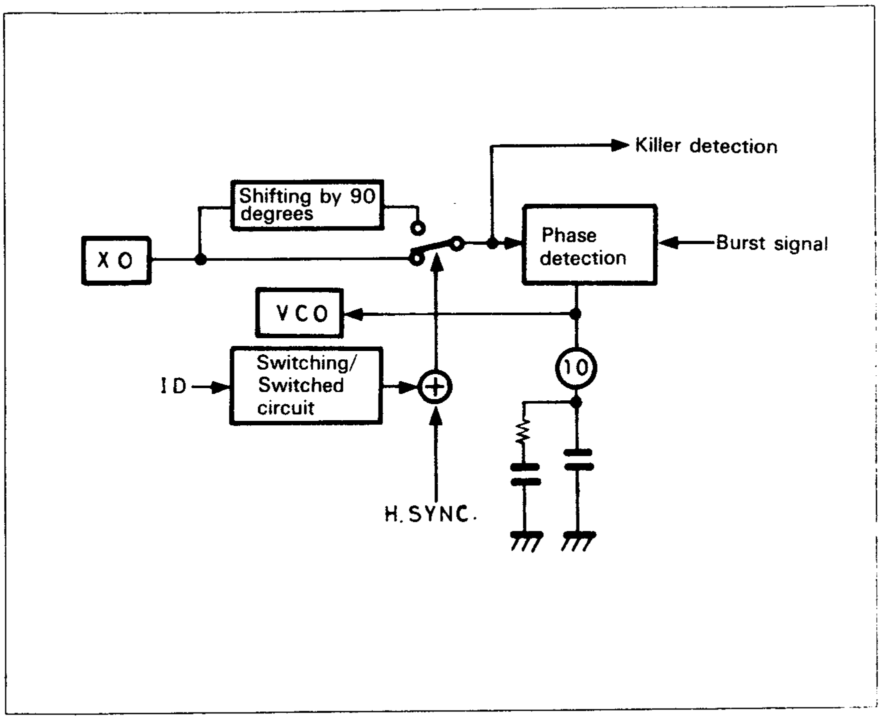
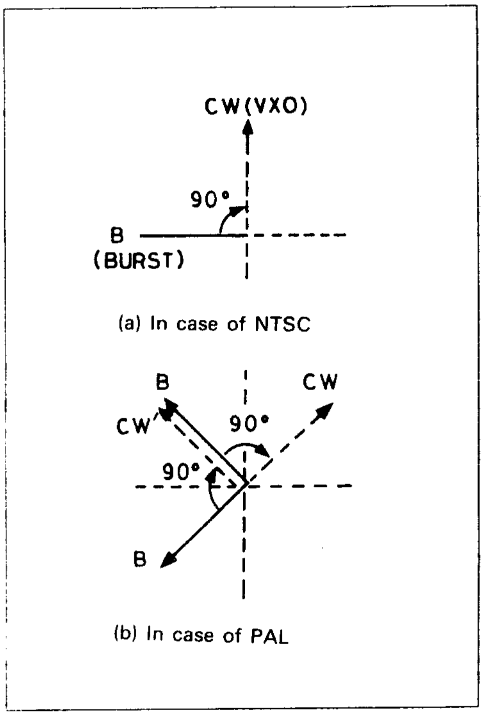

Killer detection
Shifting by 90 degrees
X O
Phase detection
Burst signal
V C O
I D
Switching/ Switched circuit
10
H.SYNC.

Fig. 3−37 PB APC Loop in PAL mode


CW(VXO)
90°
B
(BURST)
B
CW
CW
90°
90°
B

(a) In case of NTSC

(b) In case of PAL

Fig. 3−38 Phase relation when APC is locked

Noise and defect in synchronous signal may reverse the switching order of signal switch. The order may be also reversed depending on the initial condition of the switch. In such an event, switch correction circuit serves to correct switching order.
This circuit is designed to generate corrective pulse when it generates six or more ID pulses in the period of 16H.

3−4−3. PLL (AFC) of VCO

To provide phase rotation for crosstalk cancel, lock VCO frequency at value of 320 times Fh (horizontal frequency) in case of NTSC, and at that of 321 times Fh in case of PAL/SECAM. Its control circuit is shown in Fig. 3−39 below.

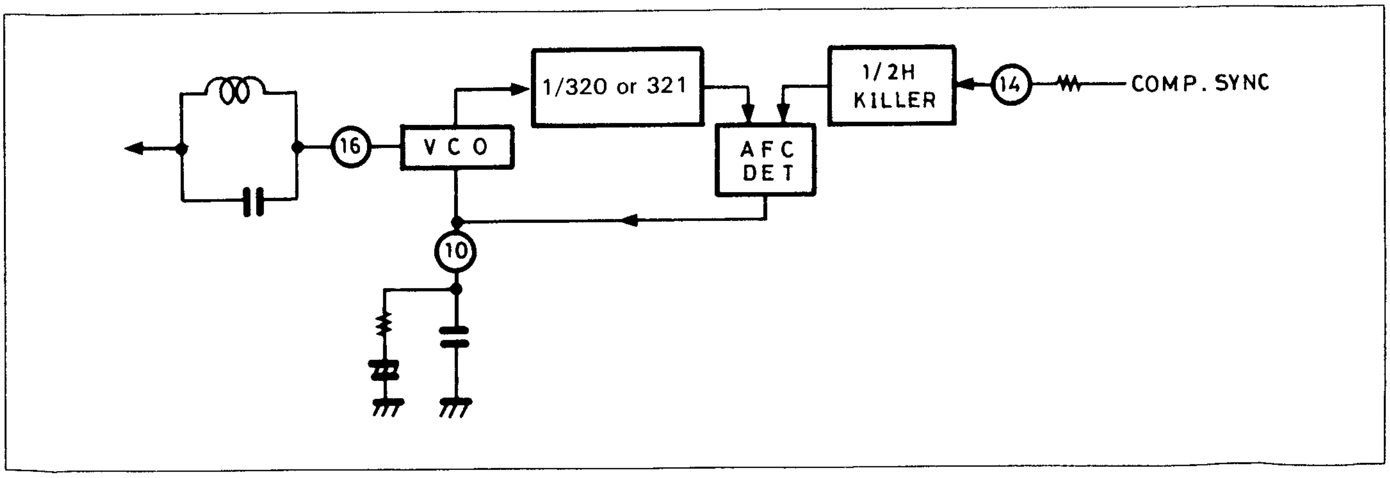

1/320 or 321
1/2H KILLER
14
COMP. SYNC
16
V C O
A F C DE T
10

Fig. 3−39 REC AFC loop

In the first place, composite synchronous pulse (H pulse) without equalized pulse period is provided. Duty of the signal is 50%.

In the meantime, VCO output frequency is divided into 320 (or 321), and gate pulse (c) is provided to be used for PLL detection. When H pulse is gated by gate pulse (c), detection output like (d) is provided. The output is smoothed by filter in ⑩ PIN in order to control VCO.

VCO is designed by making use of phase of LC tank circuit connected to ⑯ PIN; frequency characteristic.

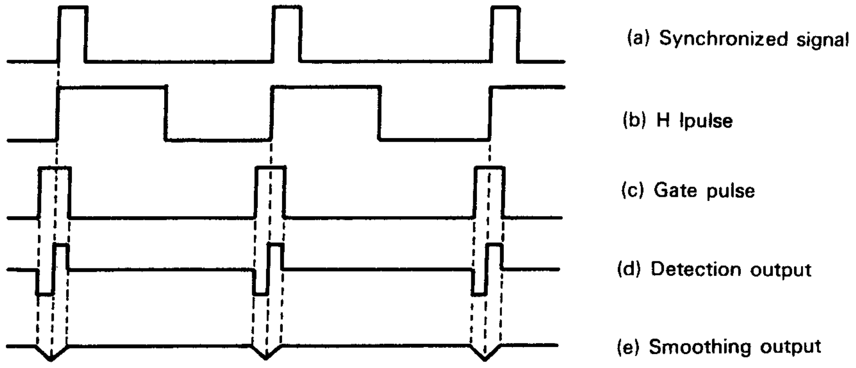

(a) Synchronized signal
(b) H Ipulse
(c) Gate pulse
(d) Detection output
(e) Smoothing output

Fig 3−40 Wave form of control circuit in VCO

VCO frequency is low.

↓

Gate pulse cycle will be extended.

↓

The upper wave of detection output will be bigger than the lower wave.

↓

Electric potential of ⑩ PIN will rise.

↓

VCO frequency will be raised.

‖

PLL will be locked when the upper and lower waves of detection output are perfectly balanced.

3−4−4. Four−phase shift circuit

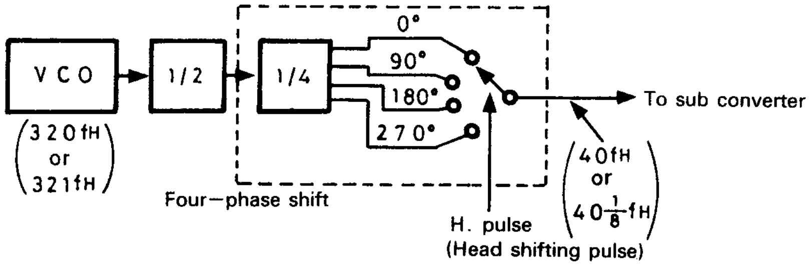

VCO
1/2
1/4
0°
90°
180°
270°
320fH or 321fH
Four−phase shift
To sub converter
40fH or $40\frac{1}{8}$fH
H. pulse (Head shifting pulse)

Fig. 3−41 Four−phase shift circuit

Four-phase shift circuit is designed as shown in Fig. 3−41. The said half divided-VCO is divided again into four in the circuit. Four signals resulted from the above process with phase different from others by 90 degrees are switched every H by H pulse to be output. Direction of phase shift depends on polarity of Head SW Pulse and signal mode input from ㉒ PIN. Its clarification is shown in the table below.

MODE	Polarity of Head SW Pulse	
	LOW (1CH)	HIGH (2CH)
NTSC	Advance by 90 degrees in every H	Lag by 90 degrees in every H
PAL	Shift stop	Lag by 90 degrees in every H
SECAM	Shift stop	Shift stop

Table 3−3

4.21(or 5.06) HMz component is gained by inputting VXO output mentioned in A) and 40Fh (or 40 8/1 Fh) output mentioned in C) to sub converter. This sub converter, operation type, is designed to add the output of regular multiplication circuit and inverted output of multiplication circuit whose input is under phase shift by 90 degrees so as not to provide difference component of unnecessary frequency.

$$\cos a \cdot \cos b - \cos(a-90^\circ) \cdot \cos(b-90^\circ)$$
$$= \cos a \cdot \cos b - \sin a \cdot \sin b$$
$$= \frac{1}{2}\left\{\cos(a+b) + \cos(a-b)\right\} + \frac{1}{2}\left\{\cos(a+b) - \cos(a-b)\right\} = \cos(a+b)$$

Actually, difference component attenuates against the sum component by about 20dB. Sub converter output directed to BPF (4.21 or 5.06 MHz) by way of ⑬ PIN is applied to ⑪ PIN and is induced to main converter.

3–4–5. PB Mode

Simplified block diagram of chroma signal PB process is shown in Fig. 43 below. As mentioned before (in REC/PB mode shift), when PB signal from Head -Amp. is applied to PIN ⑨ while applying DC voltage (not less than about 2.1 V) to PIN ⑨, PB low chroma signal (629 KHz in NTSC, 627 KHz in PAL) will be applied to PIN ⑦ by way of LPF.

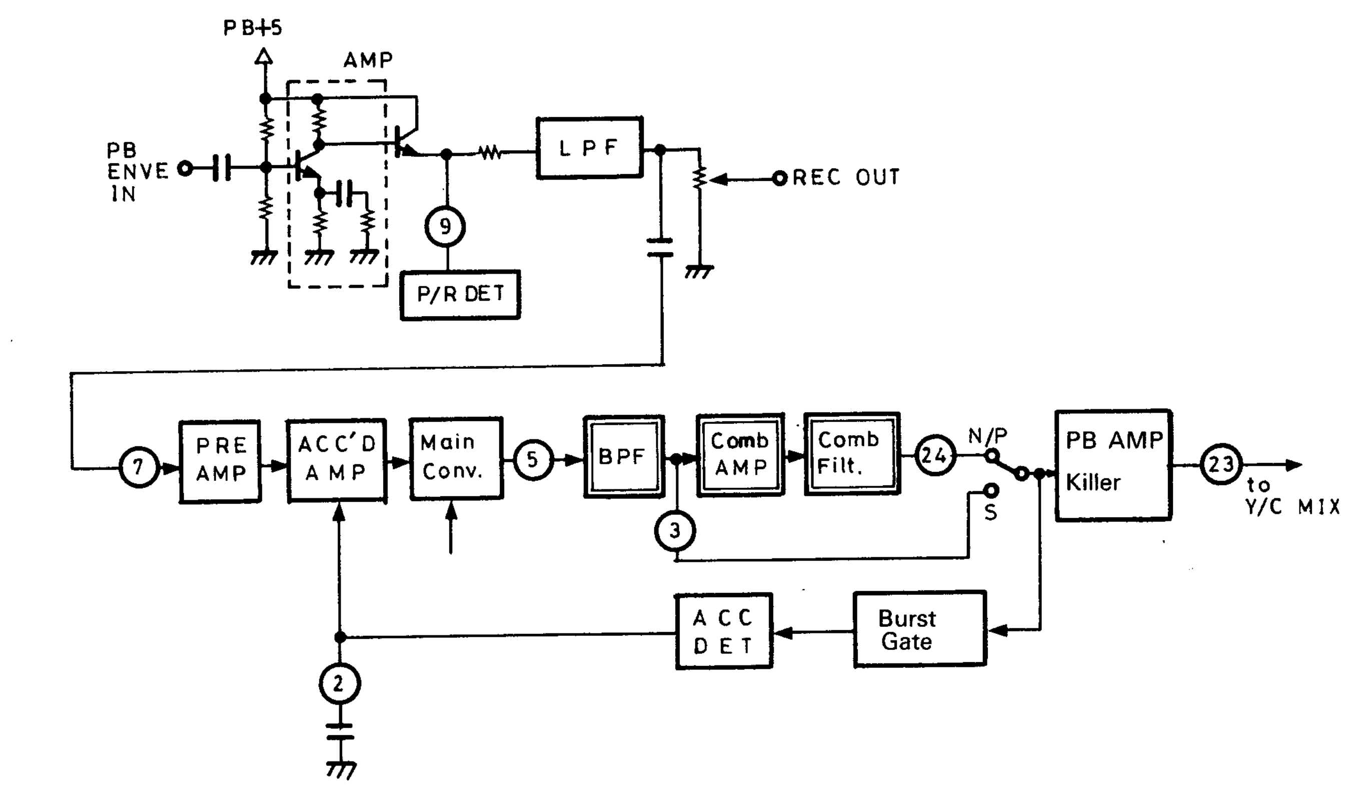


Fig 3–42 Signal Flow on PB MODE

PB low chroma signal applied to PIN ⑦ is directed to main converter by way of pre -Amp. and ACC'd Amp. The output of main converter coming from PIN ⑤ is directed to Comb -Amp. by way of BPF (Fsc) and is amplified there to compensate for loss in comb filter. Comb Amp. output is directed to PIN ㉓ by way of comb filter, PIN ㉔, PB Amp, Burst de- emphasis and killer circuit, and is induced to Y/C mixer. In MESECAM mode, however, the signal by way of BPF is inputed to PIN ③ and is induced to PB Amp. without being directed to comb- filter.
In this event, killer circuit is being turned off.

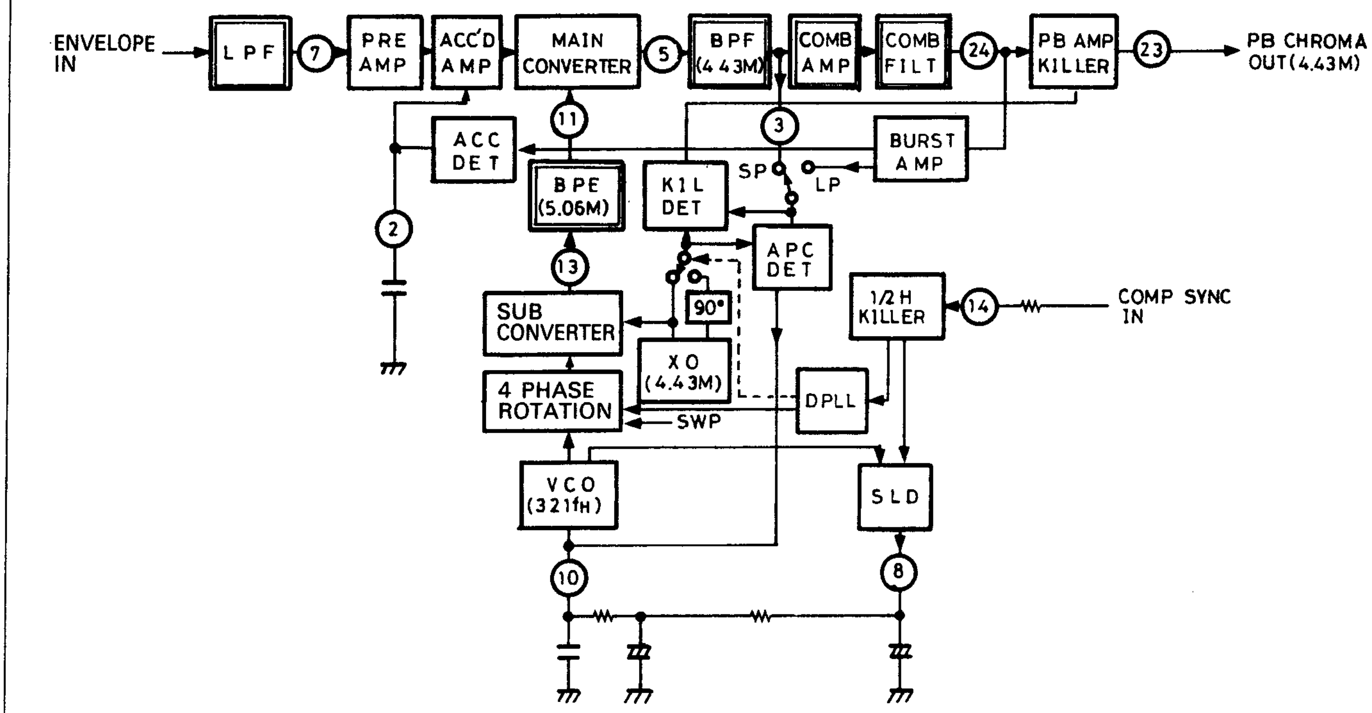

ENVELOPE IN
LPF
7
PRE AMP
ACC'D AMP
MAIN CONVERTER
5
BPF (4.43M)
COMB AMP
COMB FILT
24
PB AMP KILLER
23
PB CHROMA OUT(4.43M)
11
3
ACC DET
BURST AMP
BPE (5.06M)
KIL DET
SP
LP
2
13
APC DET
90°
SUB CONVERTER
1/2H KILLER
14
COMP SYNC IN
XO (4.43M)
4 PHASE ROTATION
DPLL
SWP
VCO (321fH)
SLD
10
8

Fig. 3-43 CHROMA PLAYBACK PROCESS

3-4-6. ACC Loop

ACC in PB mode extracts burst signal from the signal inputted to PIN ㉔, detects level, smoothes it in condenser in PIN ②, and feeds it back to ACC'd Amp. (See Fig. 3-43)

The characteristic of PB ACC is shown in Fig 3-44.

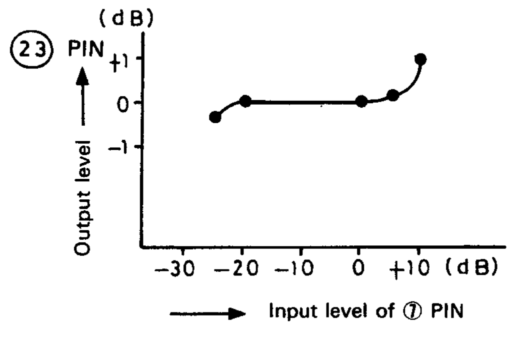


Fig. 3-44 PB ACC Characteristic

3−4−7. APC Loop

APC Loop in PB mode performs phase detection of burst signal and crystal oscillator XO,smoothes the output in PIN ⑩, and applies it to control terminal of VCO. The output of VCO is directed to four-phase rotation circuit, and is applied to sub converter. Sub converter receives the other input from the said XO. The output of sub converter is applied to main converter by way of BPF. PLL matches the phase of output burst signal with that of XO generating free oscillation.

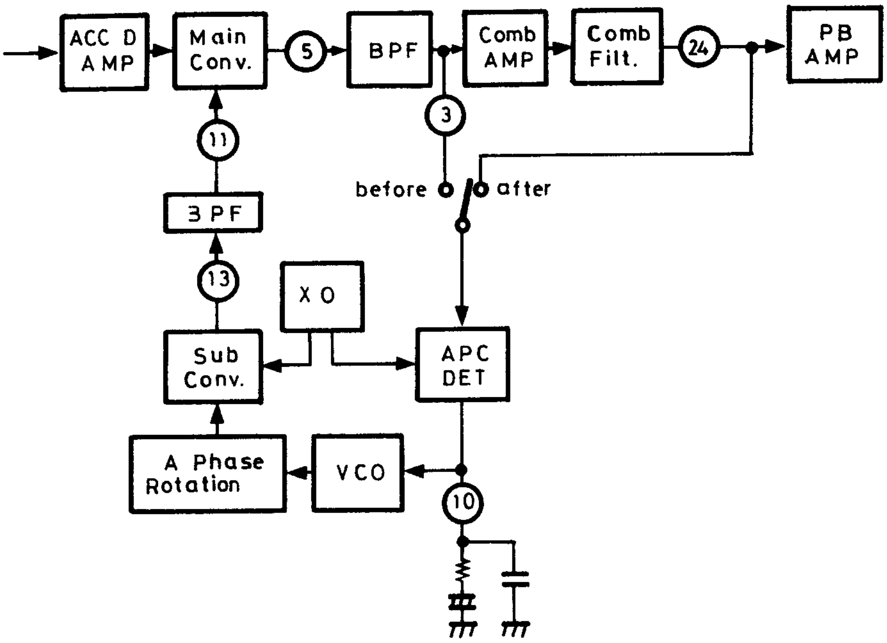

ACC D AMP
Main Conv.
5
BPF
Comb AMP
Comb Filt.
24
PB AMP
3
11
3 PF
before
after
13
X O
Sub Conv.
APC DET
A Phase Rotation
VCO
10

Fig. 3−45 APC LOOP on PB

If burst signal to be inputted to APC detecter is output before comb-filter, PM noise will be reduced due to quick response. Burst signal, however, should be output behind comb filter, because frequent crosstalk disturbs ACC loop and lowers S/N ratio.

In this unit burst signal is output from behind comb filter, because frequent crosstalk may occur in normal PB recorded in time lapse mode. If DC voltage more than 3V is applied to PIN ㉑ through diode and resistance, burst signal is forced to be output from befor comb filter.

3−4−8. Other functions

A) Function to reduce carrier leakage Beat will appear in PB screen when carrier leakage (4.21 MHz component in NTSC, 5.06 MHz component in PAL) takes place in main converter.
As shown in Fig. 3−46, in this IC, carrier leakage component of main converter output is detected and is smoothed in conderser attached to the outside of PIN ④ in order to correct balance of main converter.

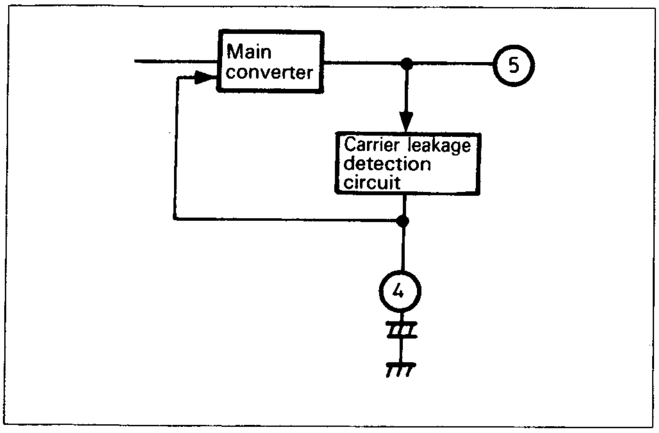


Fig. 3−46

B) Side look prevention
In playback mode, phase detection of output signal of crystal oscillator and playback burst signal is performed, and their error voltage is fed back to VCO. Even if VCO provides step−out frequency, there is a possibility that APC loop may be stabilized.

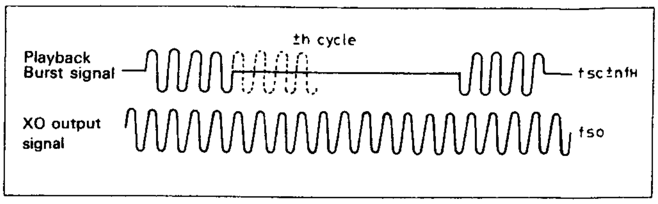


Fig. 3−47

It is because; phase detecter serves to detect two input weves shown in Fig. 3−47 in burst period only. If burst signal regarded as continuous signal has an interval of just±N cycle (N is integer) between bursts (ie. Burst signal has step-out frequencr by f_H times N), burst period itself will be in the same condition as PLL works.

$$\left.\begin{aligned}\left(\frac{f_{VCO}}{8}+f_{SC}\right)+f_{LC}&=f_{SC}.\\ \left(\frac{f'_{VCO}}{8}+f_{SC}\right)+f_{LC}&=f_{SC}\pm nf_H\end{aligned}\right\}\quad\begin{aligned}\frac{f'_{VCO}}{8}&=\frac{f_{VCO}}{8}\pm nf_H\\ \therefore f'_{VCO}&=\underset{\sim\sim\sim}{f_{VCO}}\pm 8nf_H\end{aligned}$$

Therefore even if oscillation frequency of VCO is stepped out by f_H times 8 • n, PLL will work (side lock condition) to disturb hue. Side lock detecter counts cycle of VCO in 4H period. With the count exceeding the regular renge (within±4count), side lock detecter generates correction pulse to prevent side lock. Condenser attached to the outside of PIN ⑧ serves as filter of the correction pulse.

C) Head SW pulse input and SP EP/LP switch
In this IC, head SW pulse input terminal to decide the direction of SW pulse is shared with switching control terminal of SP EP/LP.

		NTSC	PAL
Head SW Pulse	Low (1CH)	Advance by 90 degrees every H	STOP
	High (2CH)	Lag by 90 degrees every one H	Lag by 90 degrees every one H
SP • EP		Make burst up/down	Set APC loop before comb
LP		Do not make burst up/down	Set APC loop after comb

Table 3−4

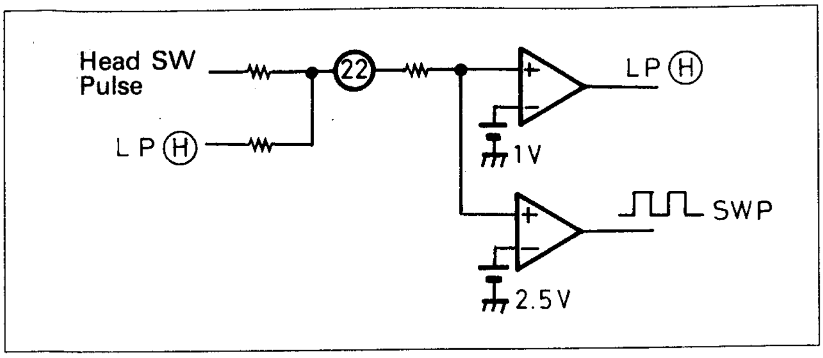

Head SW Pulse
LP Ⓗ
㉒
LP Ⓗ
1V
SWP
2.5V

Fig. 3−48

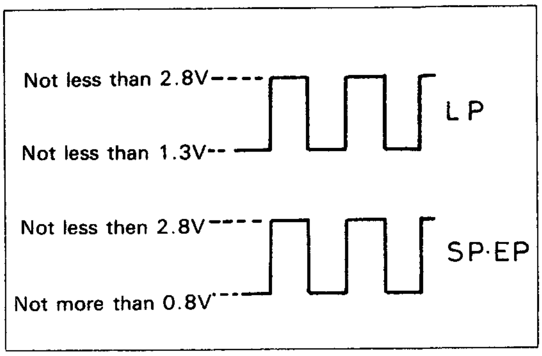

Not less than 2.8V
Not less than 1.3V
LP
Not less then 2.8V
Not more than 0.8V
SP·EP

Fig. 3−49

As shown in Fig. 3−48, two comparators are connected to PIN ㉒, discriminating two conditions shown in Fig. 49. PIN ㉒ pulse exceeding 2.5V is received as head sw pulse, the pulse with lowest point of not less than 1.3V is received as LP mode, the pulse with lowest point of not more than 0.7V is received as SP EP mode. Decide outside constant so as to meet the above conditions.

D) Function of PIN ⑮

PIN ⑮ serves as APC filter in REC mode and as control terminal for special playback in PB mode.

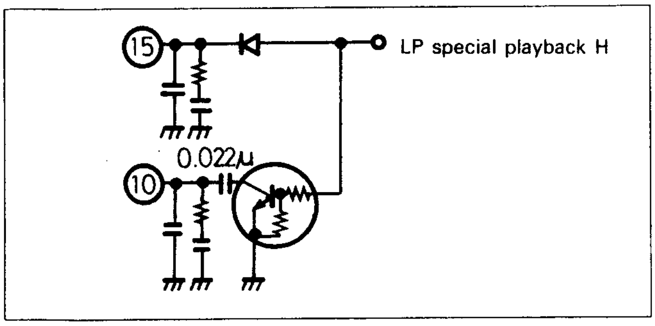

⑮
LP special playback H
0.022μ
⑩

Fig. 3−50

When PIN ⑮ is lifted while PAL is specially played back in LP mode, PIN ⑮ stops phase shifting of input signal (±45°) per H and masking of SLD output for 19H period from the SWP edge. In the meantime, clock for phase rotation will be derived from half H killer output instead of from DPLL output. The above steps prevent color from fading in case of discontinuity in color alignment. In this event, condenser must be set between PIN ⑩ and GND as shown in Fig. 3-50 in order to lengthen time constant in APC period. The inside of PIN ⑮ is as shown in Fig. 3−51. When voltage of PIN ⑮ exceeds 3.8V (Current capacity must be not less than 1.0 Am), logic circuit will be driven.

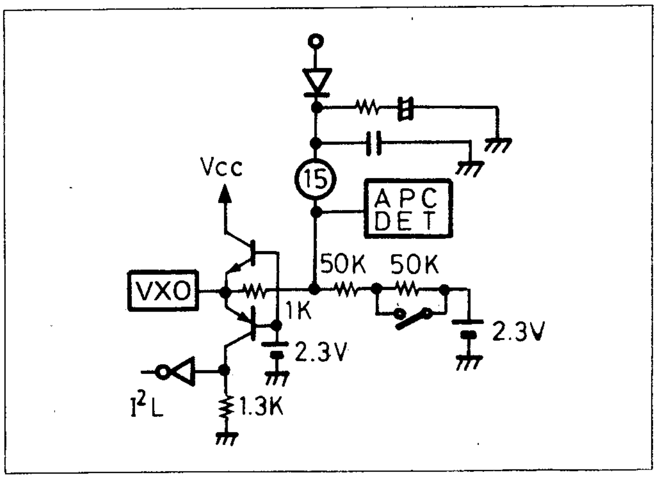

Vcc
⑮
APC DET
VXO
50K
50K
1K
2.3V
2.3V
I^2L
1.3K

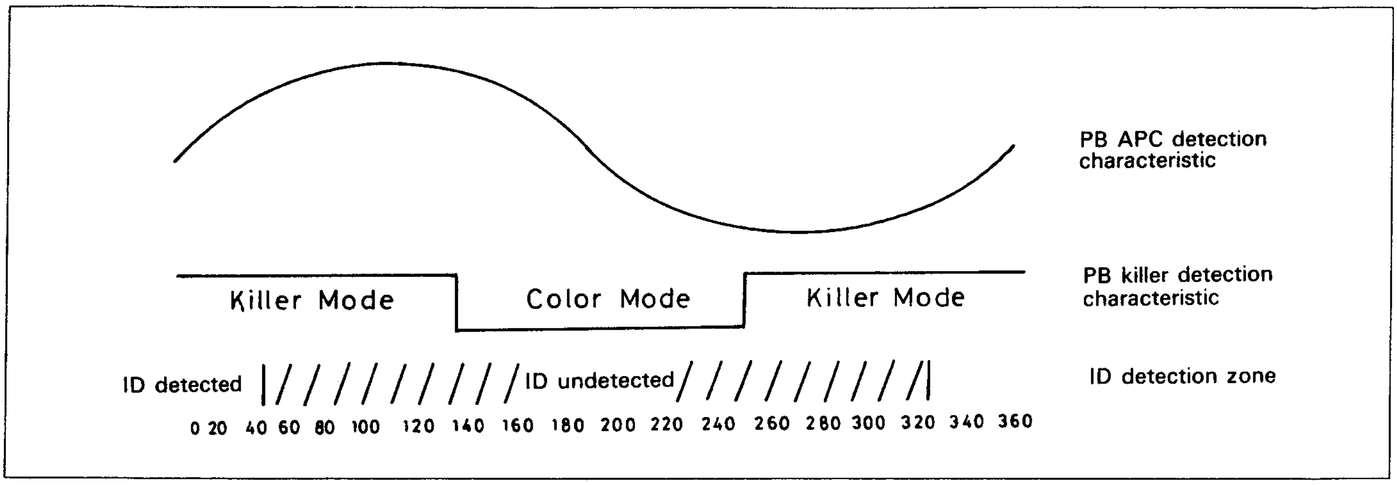
Fig. 3−51

	Pin ⑮ : Open	Pin ⑮ : High
APC Rct • ±45° shift	Shifting	No shifting
SLD	Masking for 19H period from the SWP edge	No masking
Clock	DPll output	Half H killer output

Table 3−5

E) ID function

This IC contains ID function to correct discontinuity of burst phase. When its built-in condenser for ID detection operates, it inverts polarity of sub converter output. But it does not perform phase inversion in the following burst period to prevent malfunction of comb filter. (As the result, in PAL mode ID function is inhibited for 2 H period.) Range of ID detection is as shown in Fig. 3−52.



Fig・ 3−52.

F) Crystal oscillator／VXO

In this IC, recording VXO is switched over by playing back free oscillatir for the sake of non adjustment of free oscillator. (Fig. 3−53) This IC adopts variable phase converter of vector composite type, serving recording VXO as well as playing back free osvillator with simple circuit for less phase rotation in IC. Crystal oscillator can generate not only fundamental oscillation but also the third oscillation easily. In regular IC, LPF is added to oscillation loop in order to lower loop gain in the third frequency and prevent the third oscillation. But with function of the third lock protect in this IC, the said LPF is not necessary except when oscillation is made in the third frequency. The third lock function improves accuracy in frequency, needing less outer parts. Dispersion per IC is approx. 2 PPM.

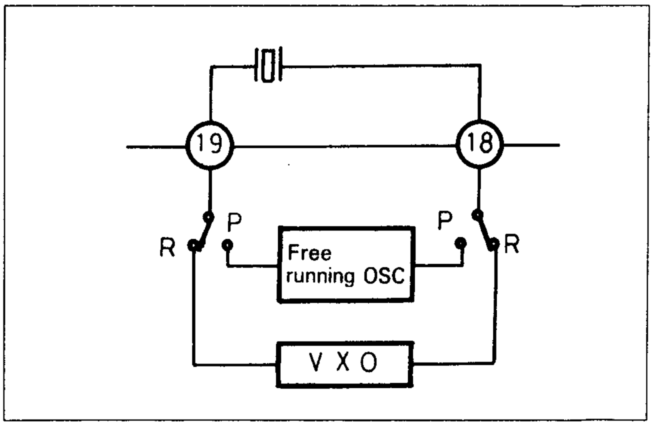
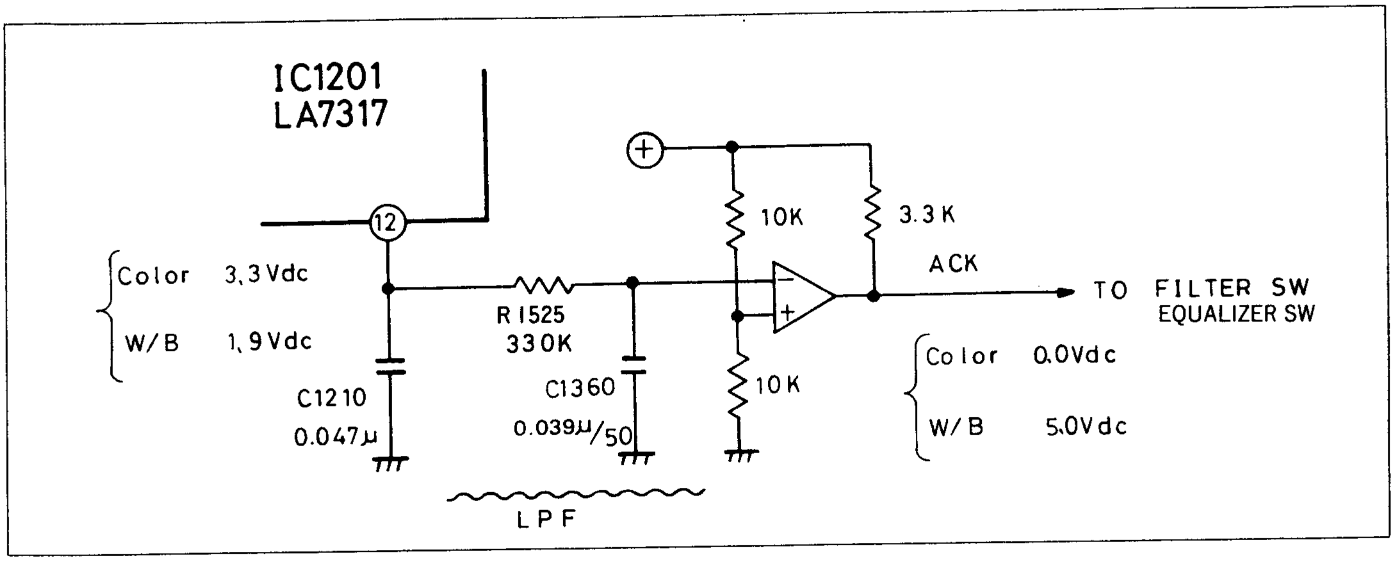


Fig 3−53

Note: In REC mode while ACC killer works due to B&W or weak electric fiels, and in MESE CAM mode, free oscillation is switched over to work.

3–4–9. ACK

Taking advance of the difference in the Killer Filter advantage of IC1201, 12 pin between the color and W/B modes, the ACK is to distinguish the color form the W/B with a comparator by filtering the signal.



IC1201
LA7317
12
Color 3,3Vdc
W/B 1,9Vdc
C1210
0.047μ
R1525
330K
C1360
0.039μ/50
LPF
10K
10K
3.3K
ACK
TO FILTER SW
EQUALIZER SW
Color 0.0Vdc
W/B 5.0Vdc

Fig. 3–54

The LPF is involved in the route of the Killer Filter output of the 12 pin, so that the Y-LPF may not be changed over because the comparator output ACK wavers owing to any ACK malfunction of IC1201, thus the involved LPF having a large time constant.

3-4-10.

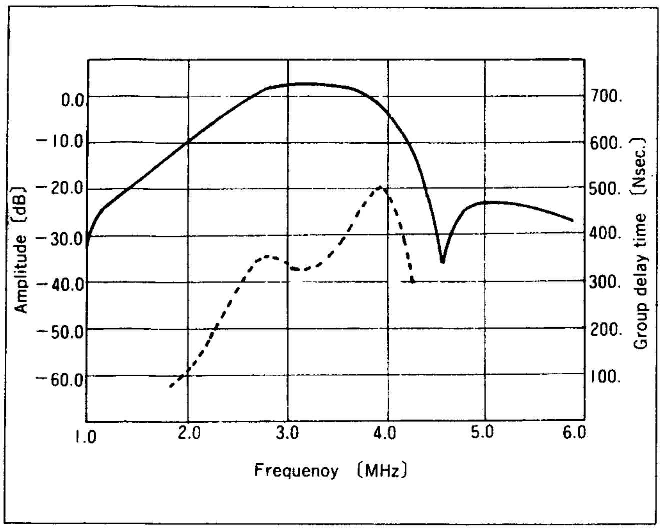


Fig. 3-55 4.43 MHz BPF

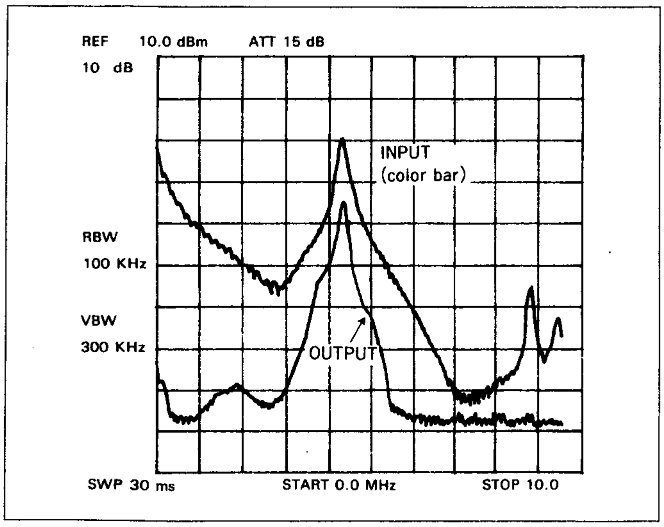


Fig. 3-56 4.43 MHz BPF EFFECT (REC,E-E MODE)

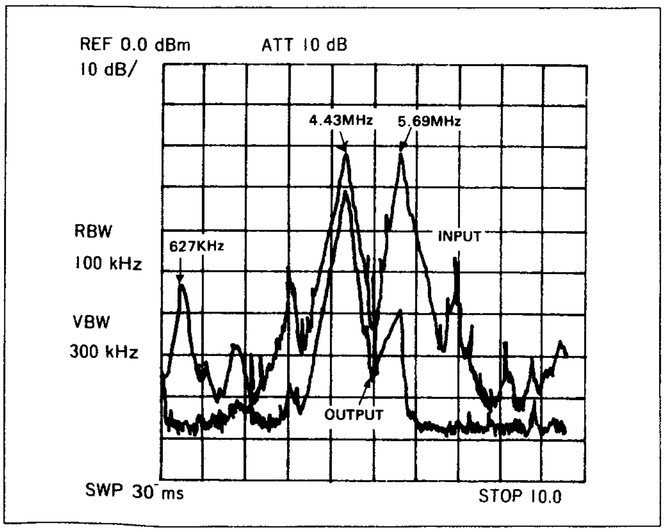


Fig. 3-57 4.43 MHz BPF EFFECT (PLAY MODE)

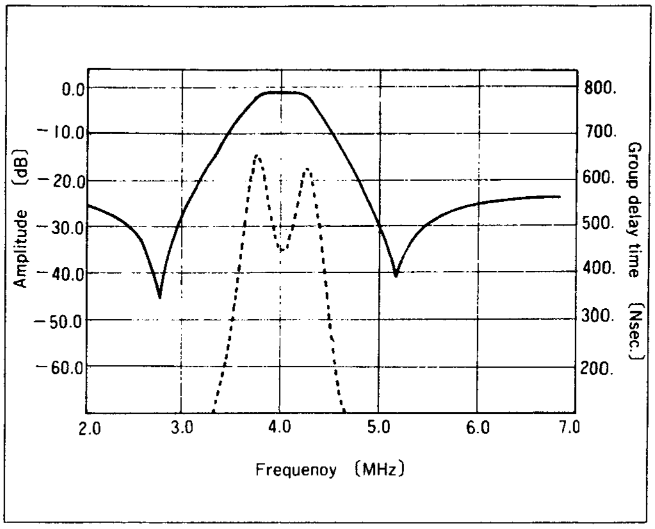


Fig. 3-58 5.06 MHz BPF

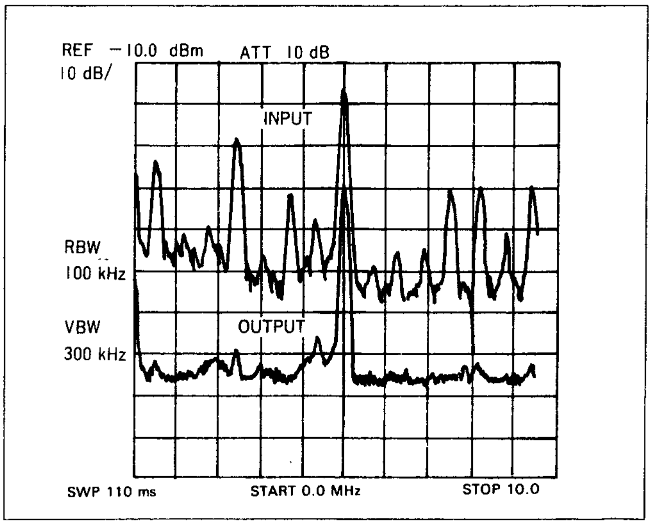


Fig. 3-59 5.06 MHz BPF EFFECT (REC, E-E MODE)

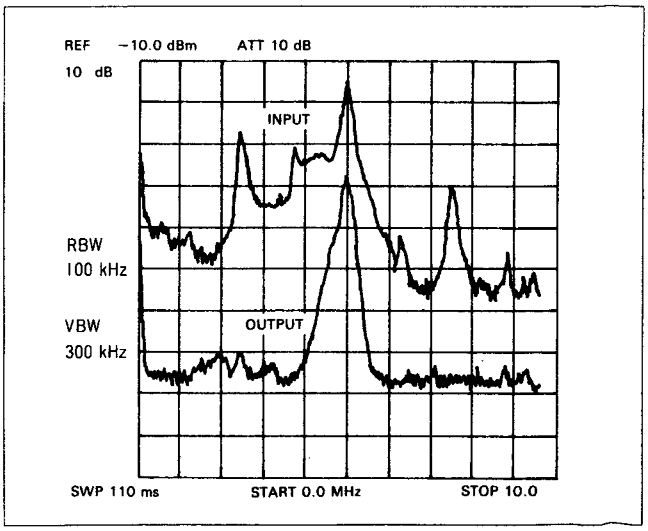


Fig. 3-60 5.06 MHz BPF EFFECT (PLAY MODE)

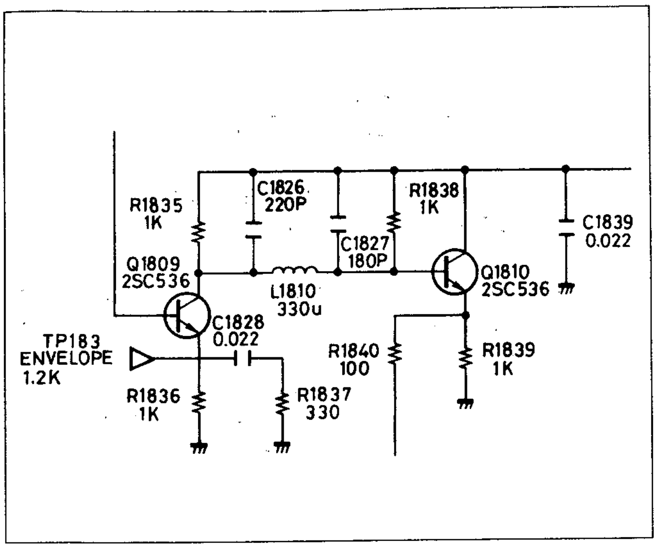

R1835
1K
C1826
220P
R1838
1K
C1839
0.022
Q1809
2SC536
C1827
180P
L1810
330u
Q1810
2SC536
TP183
ENVELOPE
1.2K
C1828
0.022
R1840
100
R1839
1K
R1836
1K
R1837
330

Fig. 3-61 627 kHz BPF

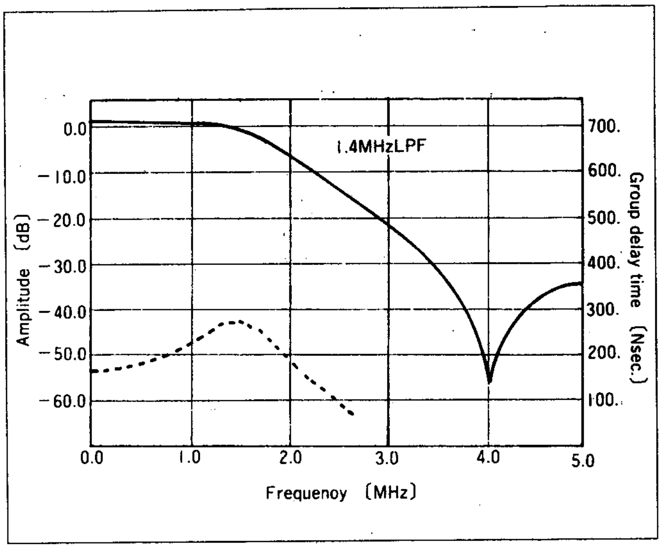


Fig. 3-64 1.6 MHz LPF

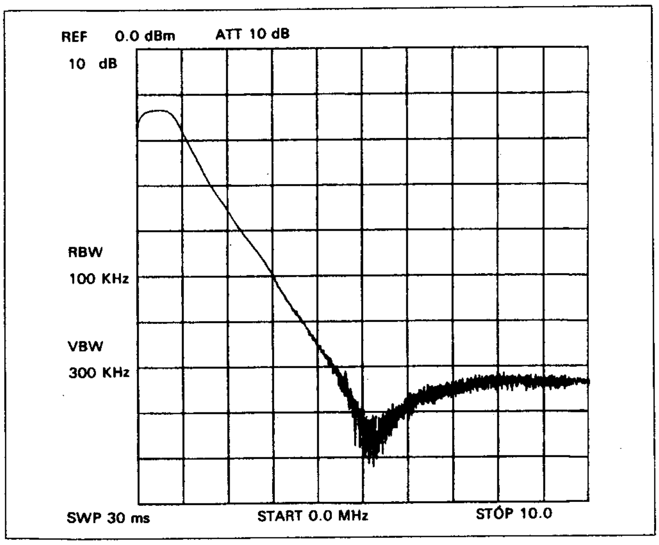


Fig. 3-62 627 kHz BPF

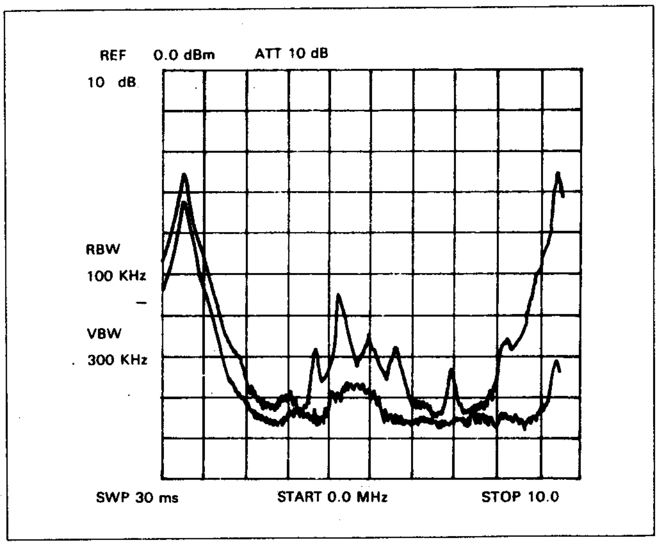


Fig 3-65 1.6 MHz LPF EFFECT

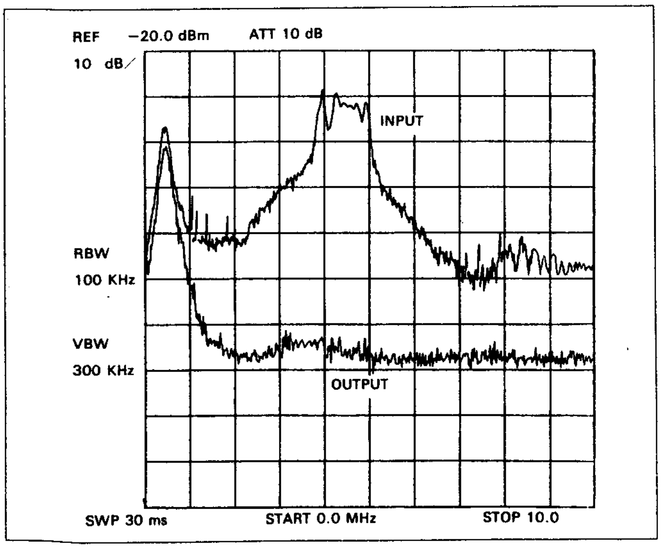


Fig. 3-63 627 kHz BPF EFFECT

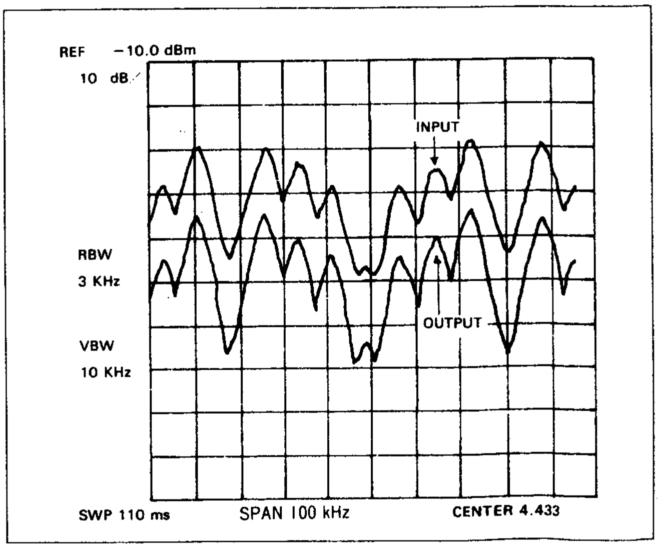


Fig. 3-66 Comb Filter Effect

3-5. Interface Circuit

3-5-1. FALSE V-PULSE GENERATOR CIRCUIT

This circuit is to generate the pulse that shoots in the false vertical synchronizing signal for preventing vertical fluctuation in a special playback.
The mute level changes depending on the input voltage of IC LA7322, 21 pin.

21 Pin input voltage	Mute level
3.6 V or more	Sink tip
1.9 to 3.2 V	Pedestal
1.5 V or less	null

The QV generator circuit and the signal waveforms for each part are shown in Fig. 3-67.

3-5-2. HEAD SWITCHING SIGNAL GENERATOR CIRCUIT

This circuit is to generate the chroma-related rotary signal corresponding to head switching and the Head Amp SW signal.
Depending on the signal coming into 9 pin and 10 pin of IC1501, TC4052, the methods of the head switching are as the following table shows:

HEAD EX1 9 Pin	HEAD EXO 10 Pin	Head to used		
L	L	Normal	MAIN for 2H playback All of 4 heads for special playback	MAIN (+,−) SUB (+,−)
L	H	SUB	SUB head only	SUB (+) SUB (−)
H	L	(−) Azimuth Head	(−) Azimuth head only	MAIN (−) SUB (−)
H	H	(+) Azimuth HEAD	(+) Azimuth head only	MAIN (+) SUB (+)

Table 3-6

Fig. 3-68 shows the structre of the video head;
Fig. 3-69 shows the HEAD SWITCHING SIGNAL GENERATOR CIRCUIT.
Fig. 3-70 shows the timings between the SWP and the ROTARY, HA, and SW for each head mode used, udring a 2H mode playback and,in the other case, of STILL-ADVANCE process.

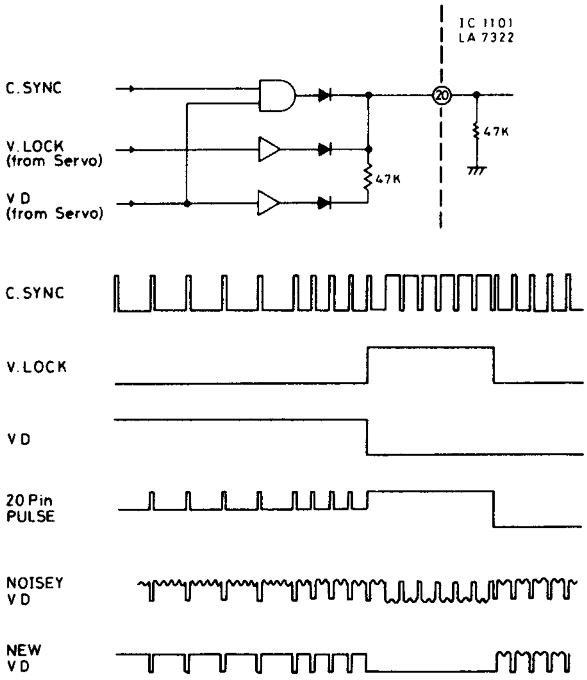


Fig. 3-67. QZ GENERATOR CIRCUIT AND ITS WAVEFORMS

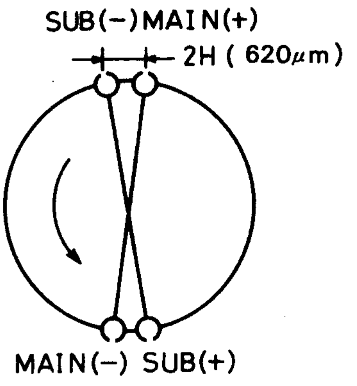

SUB(−)MAIN(+)
2H (620μm)
MAIN(−) SUB(+)

Fig. 3−68. VIDEO HEAD'S CONFIGURATION

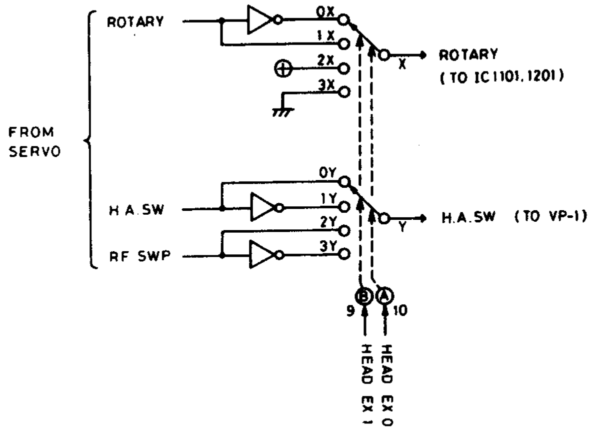

FROM SERVO
ROTARY
H.A.SW
RF SWP
0X
1X
2X
3X
X
ROTARY (TO IC1101, 1201)
0Y
1Y
2Y
3Y
Y
H.A.SW (TO VP-1)
B
A
9
10
HEAD EX 1
HEAD EX 0

Fig. 3−69. HEAD SWITCHING SIGNAL GENERATOR CIRCUIT

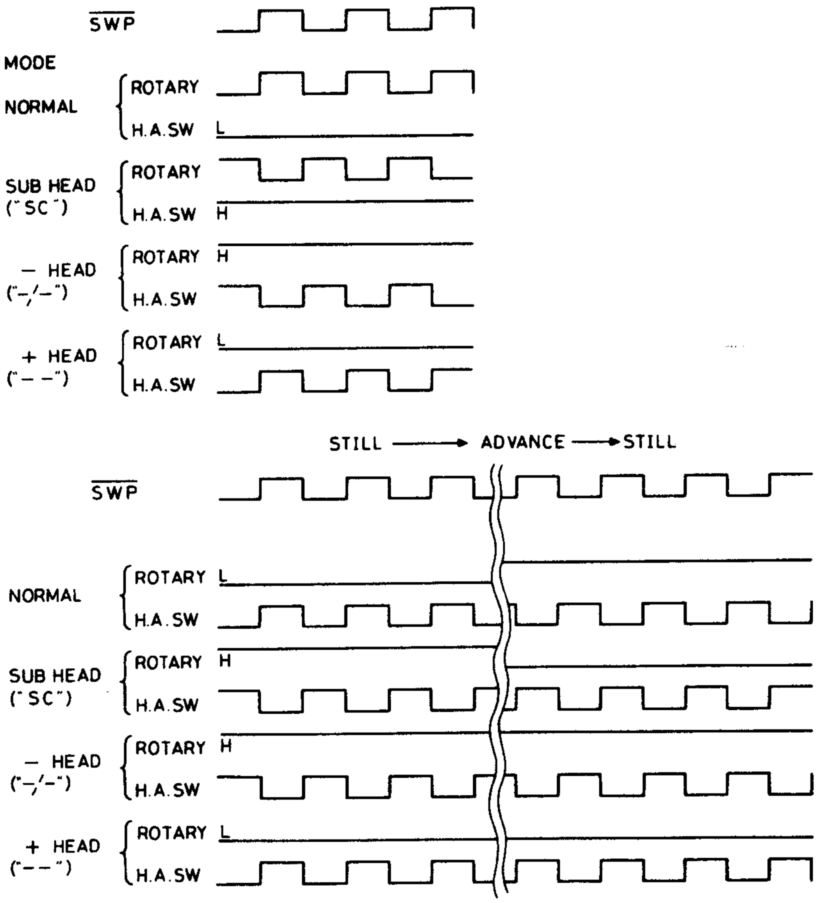


Fig. 3−70. HEAD SWITCHING SIGNAL/3H PLAYBACK

3-5-3. REC GATE SIGNAL GENERATOR CIRCUIT

In the time lapse mode recording, it is necessary to thin out the video signal for racording. For this purpose, applying "Low" to the mute terminal (20 pin of IC181) of the REC AMP will cause the recording current to be muted.

In addition, since this mute terminal is used as the switching pulse which switches in playback, a REC GATE signal generator circuit is requierd as shown in Fig. 3-57. Fig. 3-58 shows the recording timing and recorded signal in the time lapse mode, and the signal in the 3H playback mode.

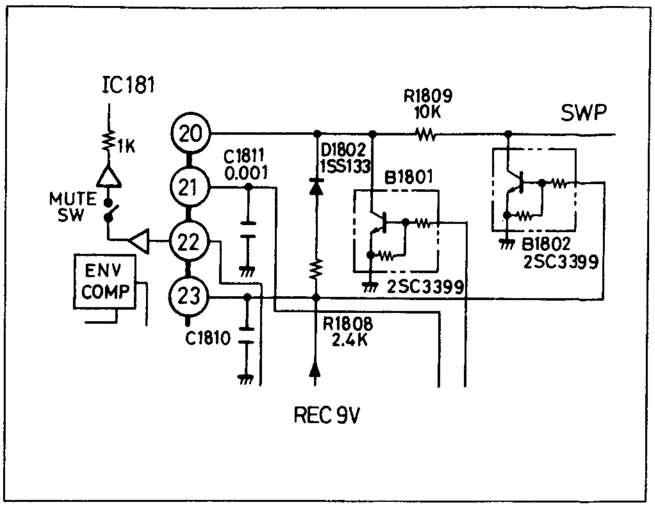

IC181
1K
MUTE SW
ENV COMP
20
21
22
23
C1811 0.001
C1810
D1802 1SS133
R1809 10K
SWP
B1801
2SC3399
B1802 2SC3399
R1808 2.4K
REC 9V

Fig. 3-57 REC GATE SIGNAL GENERATOR CIRCUIT

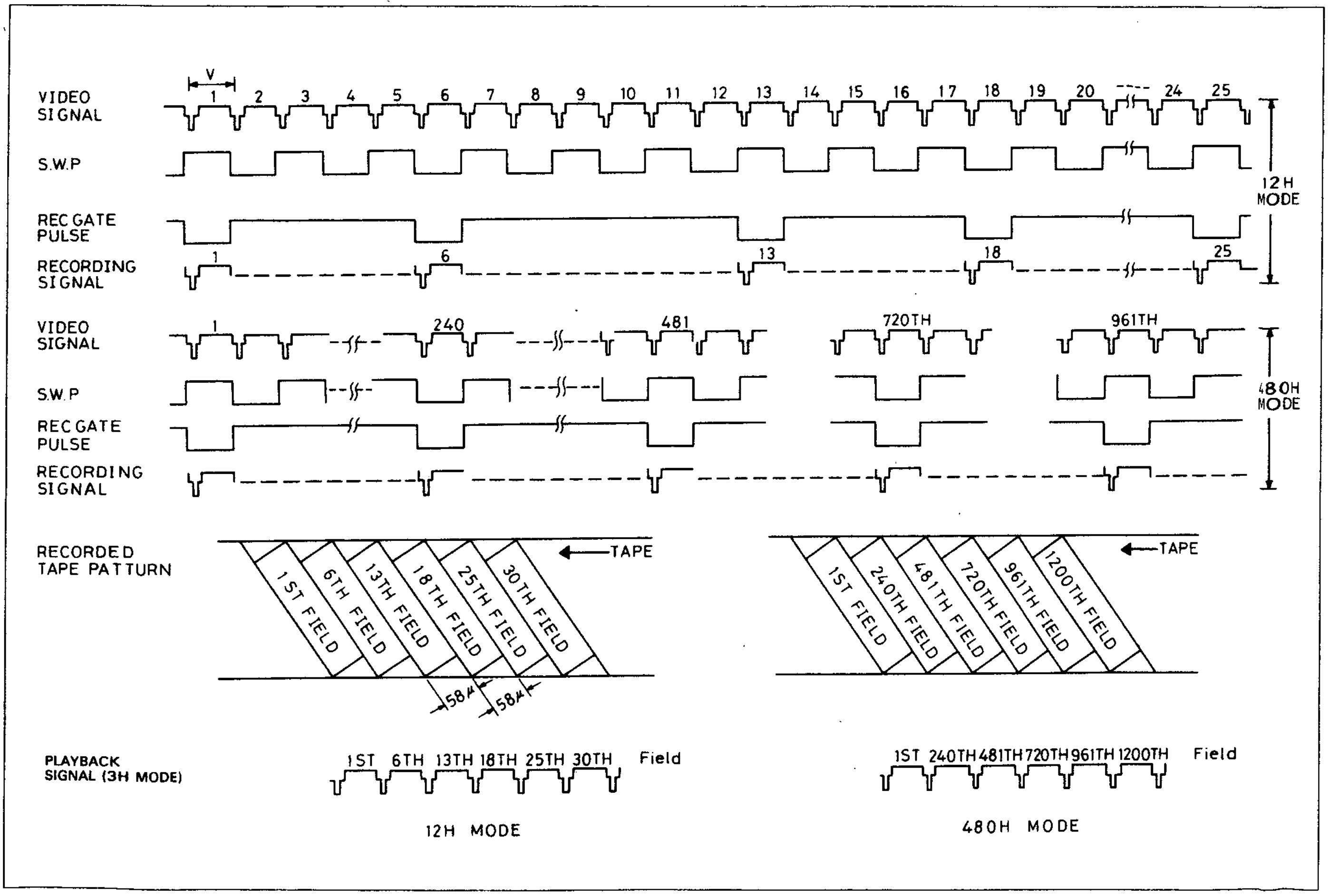

V
VIDEO SIGNAL
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 24 25
S.W.P
REC GATE PULSE
RECORDING SIGNAL
1 6 13 18 25
12H MODE
VIDEO SIGNAL
1 240 481 720TH 961TH
S.W.P
REC GATE PULSE
RECORDING SIGNAL
480H MODE
RECORDED TAPE PATTURN
1ST FIELD
6TH FIELD
13TH FIELD
18TH FIELD
25TH FIELD
30TH FIELD
TAPE
58μ
58μ
1ST FIELD
240TH FIELD
481TH FIELD
720TH FIELD
961TH FIELD
1200TH FIELD
TAPE
PLAYBACK SIGNAL (3H MODE)
1ST 6TH 13TH 18TH 25TH 30TH Field
12H MODE
1ST 240TH 481TH 720TH 961TH 1200TH Field
480H MODE

Fig. 3-58 PLAYBACK SIGNAL (3H MODE)

3−6. PAL JOG circuit

This circuit is to correct color alignment of color PAL signal recorded in time lapse mode when PAL signal is played back. Its block and circuit diagrams are shown in Fig. 3−73, and 3−74 respectively.

3−6−1. The reason for necessity of color alignment correction (See Fig. 3−75)

In time lapse mode, video signal (a) is recorded intermittently by order of odd feeds and even feeds (b). In this field recording system, stilled tape records 313H per per track while cylinder is decelerated. (c) Head trace of the tape played back normally (3H mode) is shown in slash (d), having 311. 5H per field (e). As the result, color alignment becomes discontinuous at switching point in SWP (e). If its signal is output without correction, color step−out will occur in monitor TV.

To prevent color step−out, color alignment must be corrected in the circuit.

Corrected alignment shown in (f) does not provide color step−out.

In still picture, playback video signal has the same trace as in recording (g), with 313 H per field, resulting in discontinuous color alignment in SWP.

Ther color alignment will be corrected, too. (h)

Puring searching, color signal of PAL is longer than burst cycle in sequence by four fields. (k) Asjoining track in normal recording (3H) has normal color alignment as shown in (1).

On the other hand, adjoining track recorded in time lapse mode has discontinuous color alignment as shown in Figure M. Then color alignment correction is necessary during searching, too.

Since interval of intermittent recording is set as shown in Figure N, recording is made in the first and second fields only in time lapse mode.

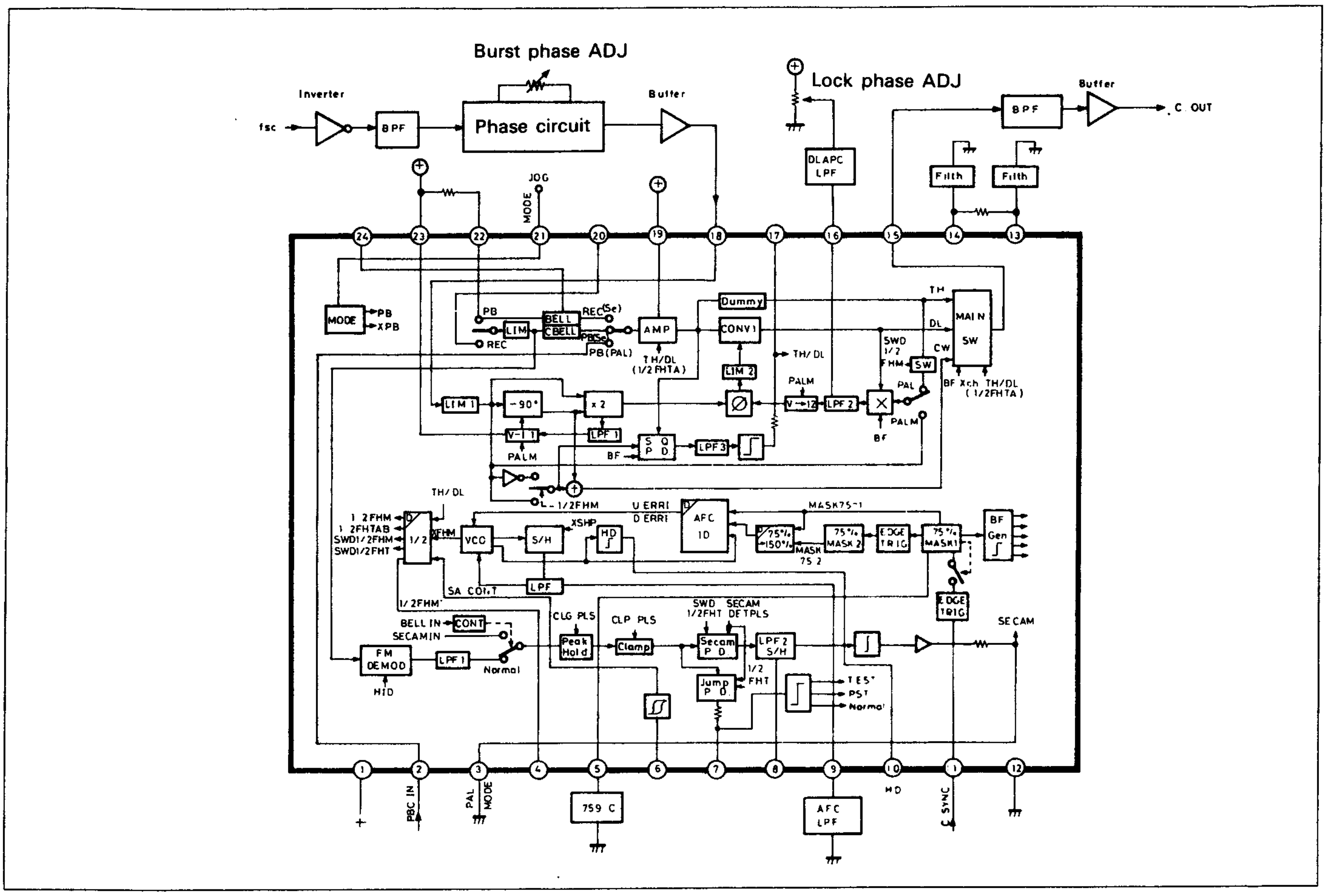

Burst phase ADJ
Lock phase ADJ
Inverter
fsc
BPF
Phase circuit
Buffer
BPF
Buffer
C OUT
DL APC LPF
Filth
Filth
JOG
MODE
MODE
PB
XPB
PB
REC
LIM
BELL
CBELL
REC(Se)
PBSe
PB(PAL)
AMP
TH/DL (1/2FHTA)
Dummy
CONV1
LIM 2
TH/DL
TH
DL
MAIN SW
CW
SWD 1/2 FHM
SW
PAL
BF Xch TH/DL (1/2FHTA)
PALM
LPF 2
LIM 1
-90°
x2
V-I 1
LPF 1
PALM
S Q P D
BF
LPF3
PALM
BF
L-1/2FHM
TH/DL
1 2FHM
1 2FHTAB
SWD1/2FHM
SWD1/2FHT
1/2
FHM
VCO
S/H
XSHP
HD
U ERRI
D ERRI
AFC ID
MASK75-1
75%/150%
MASK 75 2
75% MASK 2
EDGE TRIG
75% MASK1
BF Gen
EDGE TRIG
SA CONT
LPF
1/2FHM
BELL IN
CONT
SECAMIN
FM DEMOD
LPF 1
Normal
HID
CLG PLS
Peak Hold
CLP PLS
Clamp
SWD SECAM 1/2FHT DETPLS
Secam P D
LPF 2 S/H
1/2 FHT
Jump P D
TEST
PST
Normal
SECAM
PBC IN
PAL MODE
759 C
AFC LPF
HD
C SYNC
24
23
22
21
20
19
18
17
16
15
14
13
1
2
3
4
5
6
7
8
9
10
11
12

Fig. 3−73 Block diagram of PAL JOG circuit

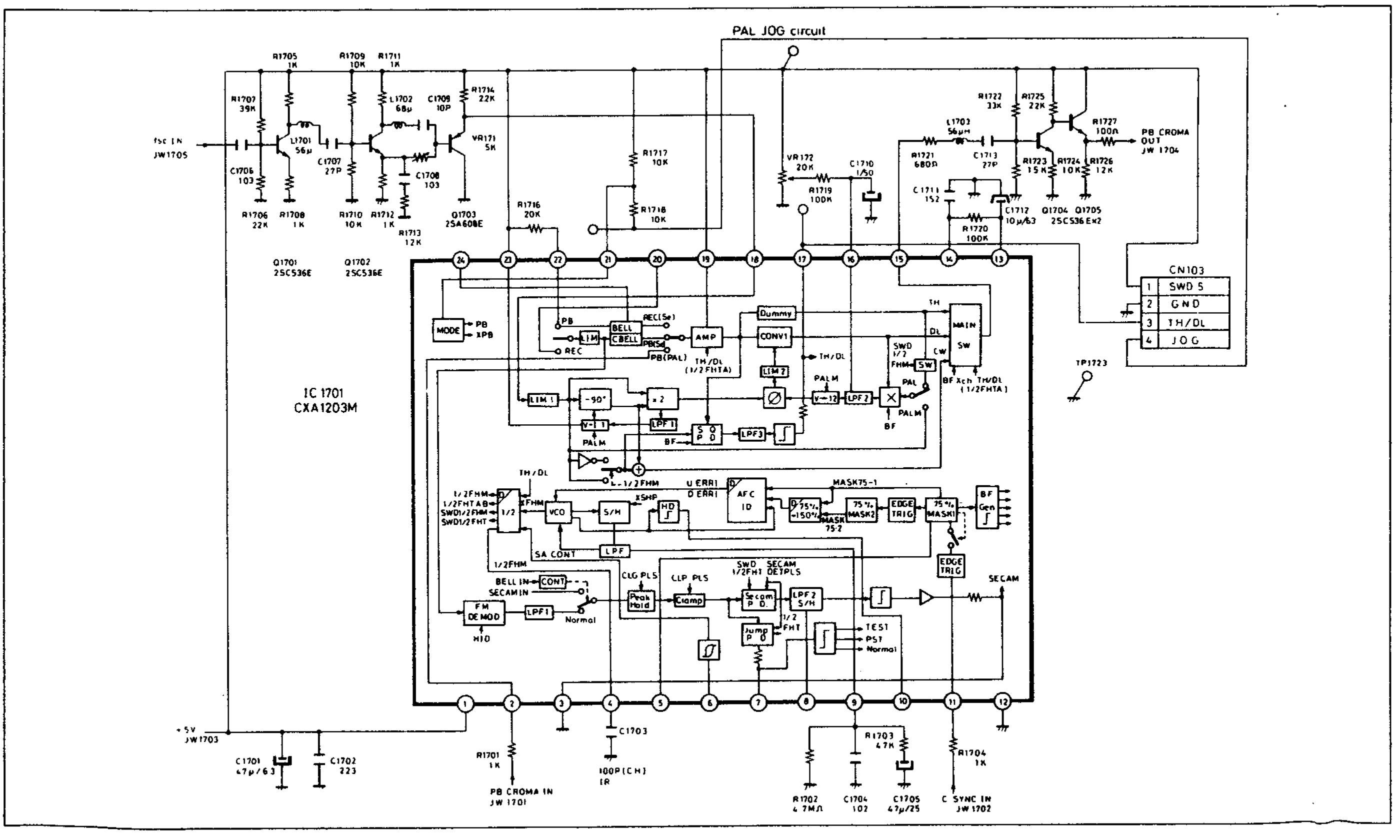

PAL JOG circuit
R1705 1K
R1709 10K
R1711 1K
R1707 39K
L1702 68µ
C1709 10P
R1714 22K
VR171 5K
fsc IN JW1705
L1701 56µ
C1707 27P
C1706 103
C1708 103
R1706 22K
R1708 1K
R1710 10K
R1712 1K
R1713 12K
Q1703 2SA608E
Q1701 2SC536E
Q1702 2SC536E
R1717 10K
R1716 20K
R1718 10K
VR172 20K
C1710 1/50
R1719 100K
R1722 33K
R1725 22K
L1703 56µH
R1721 680Ω
C1713 27P
C1711 152
R1723 15K
R1724 10K
R1726 12K
R1727 100Ω
PB CROMA OUT JW 1704
C1712 10µ/63
R1720 100K
Q1704 Q1705 2SC536E×2
CN103
1 SWD 5
2 GND
3 TH/DL
4 JOG
TP1723
IC 1701 CXA1203M
+5V JW1703
C1701 47µ/63
C1702 223
R1701 1K
PB CROMA IN JW 1701
C1703
100P(CH) 1R
R1702 4.7MΩ
C1704 102
R1703 47K
C1705 47µ/25
R1704 1K
C SYNC IN JW 1702

Fig. 3−74 Circuit diagram of PAL JOG circuit

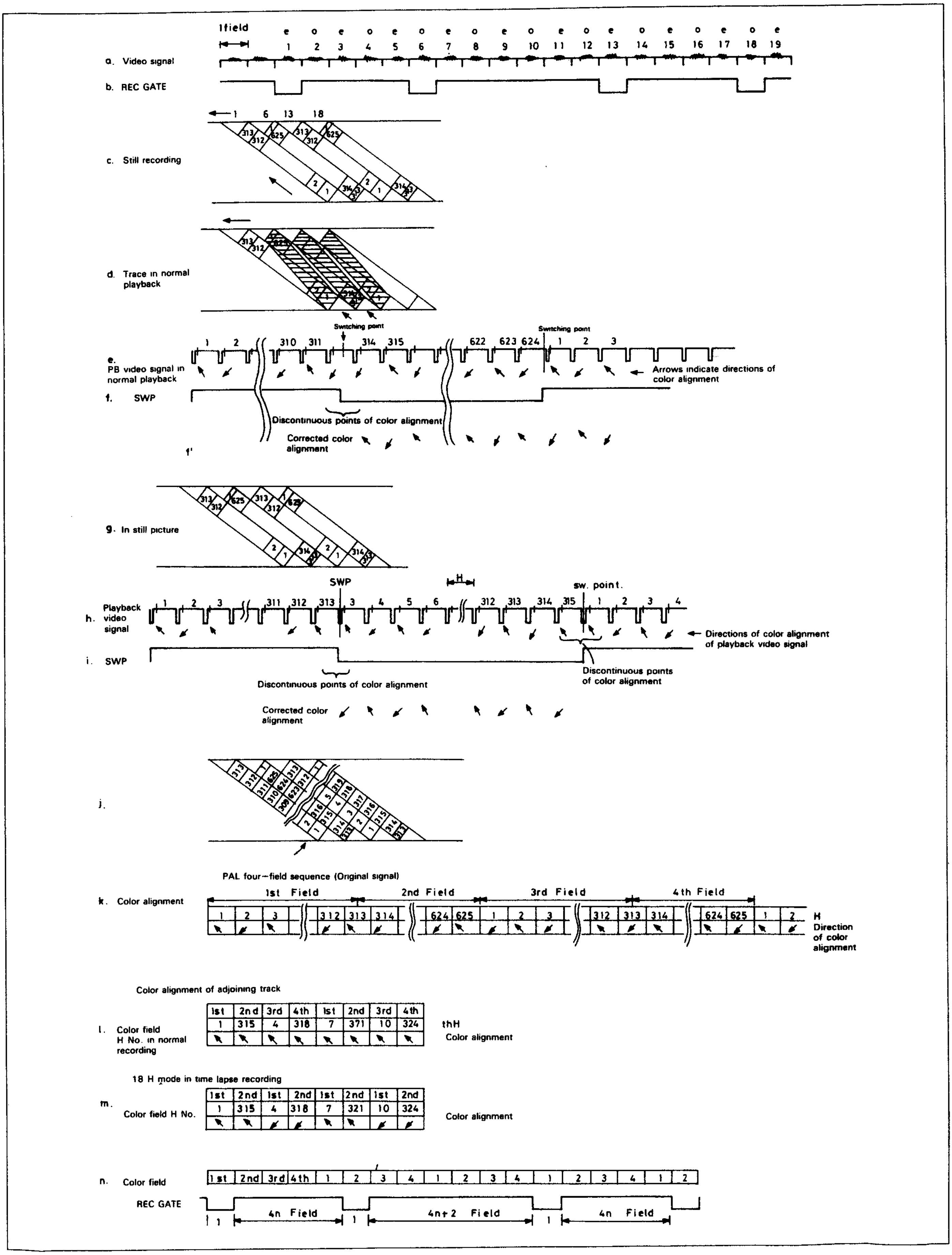

1field
e o e o e o e o e o e o e o e o e o e
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
a. Video signal
b. REC GATE
1 6 13 18
c. Still recording
d. Trace in normal playback
Switching point
Switching point
1 2 310 311 314 315 622 623 624 1 2 3
e. PB video signal in normal playback
Arrows indicate directions of color alignment
f. SWP
Discontinuous points of color alignment
Corrected color alignment
f'
g. In still picture
SWP
H
sw. point.
Playback video signal
h.
1 2 3 311 312 313 3 4 5 6 312 313 314 315 1 2 3 4
Directions of color alignment of playback video signal
i. SWP
Discontinuous points of color alignment
Discontinuous points of color alignment
Corrected color alignment
j.
PAL four-field sequence (Original signal)
k. Color alignment
1st Field
2nd Field
3rd Field
4th Field
1 2 3 312 313 314 624 625 1 2 3 312 313 314 624 625 1 2
H
Direction of color alignment
Color alignment of adjoining track
l. Color field H No. in normal recording
1st 2nd 3rd 4th 1st 2nd 3rd 4th
1 315 4 318 7 371 10 324
thH
Color alignment
18 H mode in time lapse recording
m. Color field H No.
1st 2nd 1st 2nd 1st 2nd 1st 2nd
1 315 4 318 7 321 10 324
Color alignment
n. Color field
1st 2nd 3rd 4th 1 2 3 4 1 2 3 4 1 2 3 4 1 2
REC GATE
1 4n Field 1 4n+2 Field 1 4n Field

Fig. 3-75 Intermittent recording pattern and playback signal

3−6−2. Function

(1) Gain Adjust Amp. (DL signal)
It performs gain adjustment of DL signal in PAL, PAL−M. Amp, gain is varied by varying DC voltage applied to the 19th terminal. 5V applied to the 19th terminal allows gain to be inner fixed gain, equalizing the level of TH, and DH signals. (PAL 4.43 MHz, PAL−M 3.48MHz component)

(2) fsc−90° PLL1 } BLOCK
X2
EX Burst

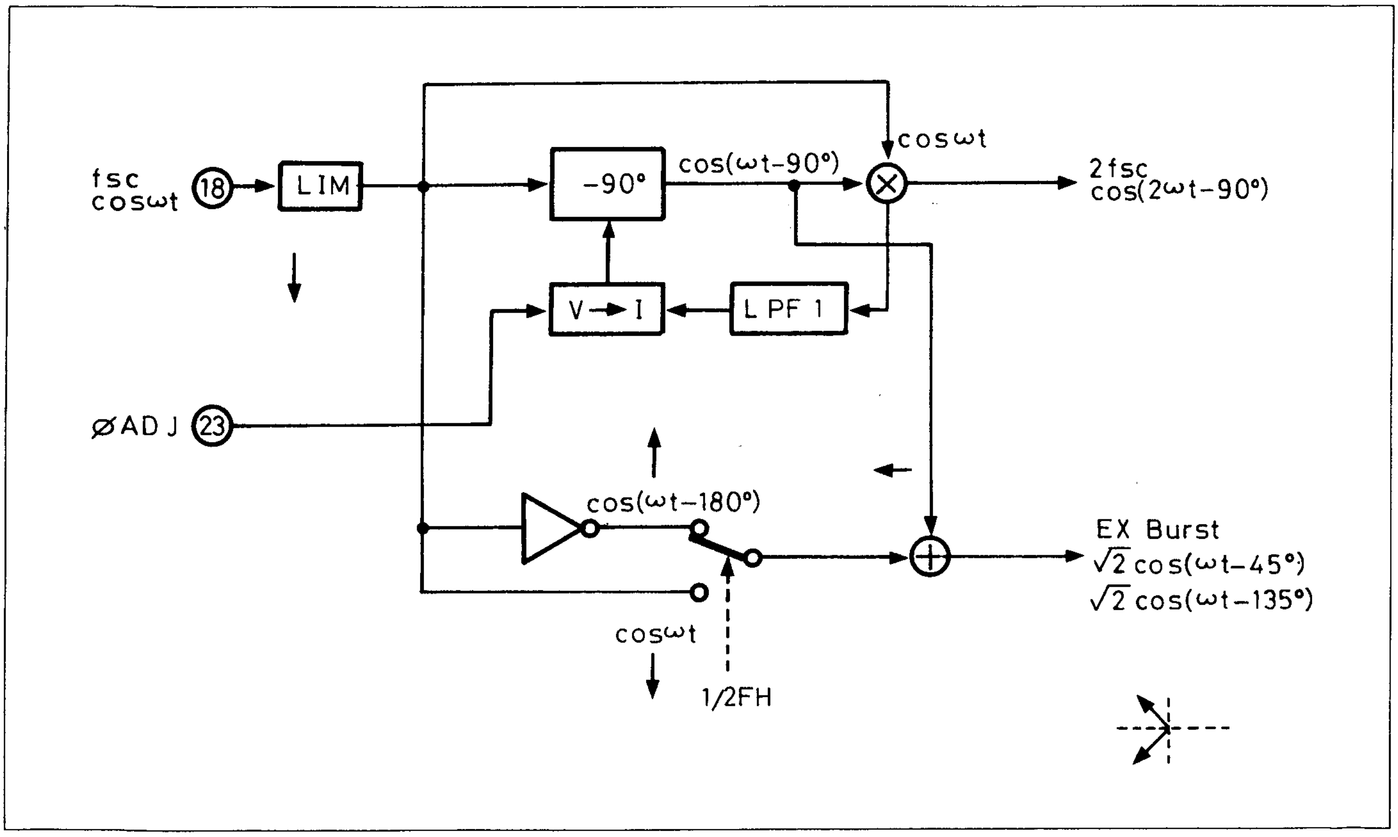


Fig. 3−76 Block diagram of fsc−90° PLL, X2, EX Burst

fsc−90° PLL, consisting of −90° phase shifter, multiplier, multiplier, LPF1, and V → I converter, is PLL loop to obtain the signal lagged by 90° against fsc. Phase shifting amount is varied by varying DC voltage to the 23rd terminal. Phase of EX burst and duty of 2fsc (DC off set) can be adjusted by varying DC voltage applied to the 23 terminal. With 5V applied to the 23rd terminal, phase shifting amount is fixed inside. 2fsc can be obtained from output of multiplier (X 2 output).
EX burst is gained by multiplying fsc (or inverted fsc) by 90° lagged fsc obtained from−90° PLL. In the above process, fsc is switched over by its inverted signal periodically in a 1/2 fH cycle, resulting in EX burst phase to be switched every H.

(3) SQ (Sequence) DET

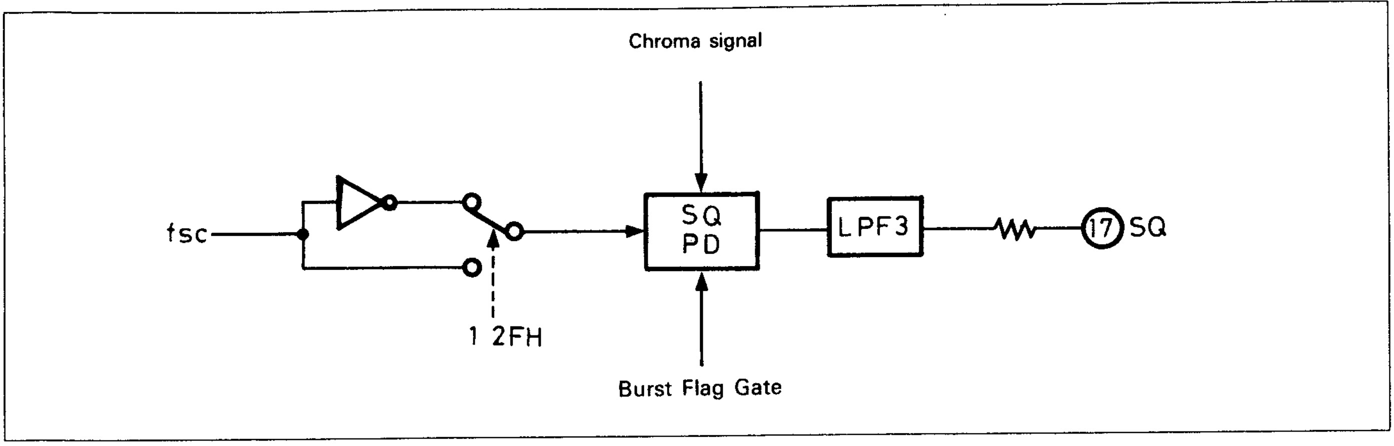

Chroma signal
fsc
SQ PD
LPF3
17 SQ
1 2FH
Burst Flag Gate

Fig. 3−77 SQ DET block diagram

SQ DET detects color alignment of chroma signal. SQ PD, a phase detecter serving in burst period only, detects color alignment by making phase comparison of fsc signal inverted every H with burst signal of chroma signal.

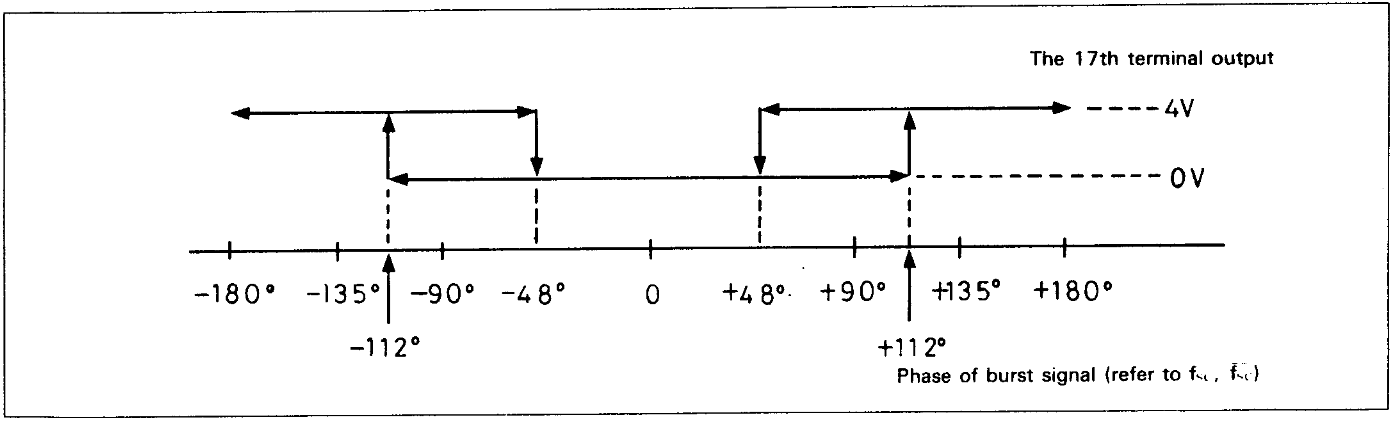


Fig. 3−78

As shown in the above Fig. 3−78 clarifying the relation among phase of burst signal, that of fsc ($\overline{fsc}$), and output of the 17th terminal (SQ), hysteresis angle is about 64 1°. With right sequence as shown in the below figure 3−79, output of the 17th terminal will set for High.

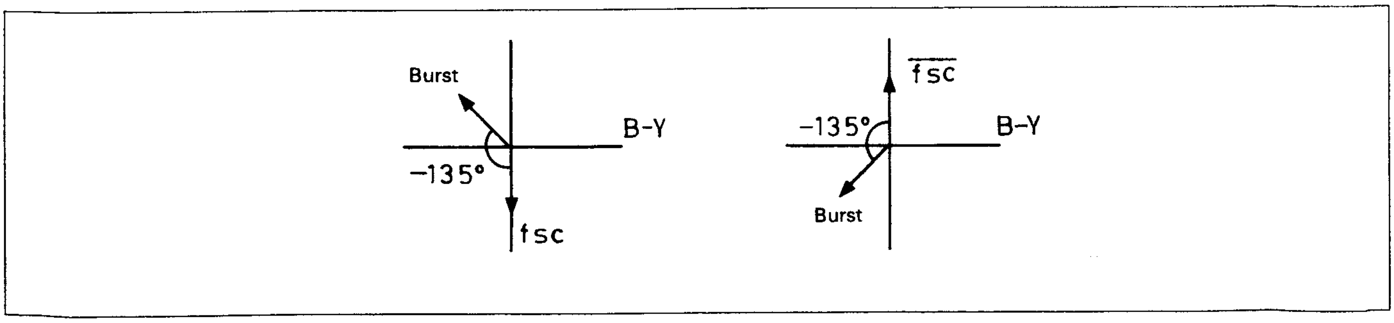

Burst
B-Y
−135°
fsc
$\overline{fsc}$
−135°
B-Y
Burst

Fig. 3−78

As the result, center phase of burst signal (B−Y axis) must be in the position at a−90 degree angle against fsc.

(4) V−Invert (V axis inverted circuit)

To correct color alignment, DL signal, ie. the inverted chroma signal (TH signal) against B−Y axis must be obtained. V−Invert block is a circuidt to produce ,DL signal from TH signal. Its principle is shown below Fig. 3−80.

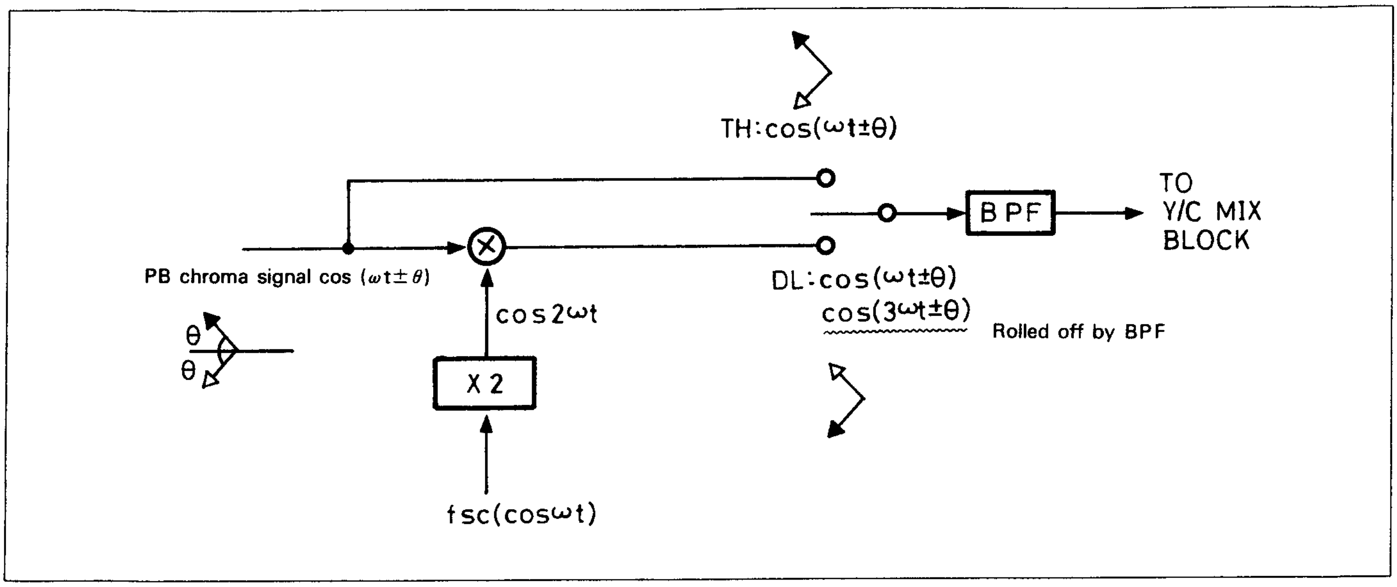

TH:cos(ωt±θ)
PB chroma signal cos (ωt±θ)
θ
θ
cos2ωt
X2
fsc(cosωt)
BPF
TO
Y/C MIX
BLOCK
DL:cos(ωt±θ)
cos(3ωt±θ)
Rolled off by BPF

Fig. 3−80 Principle of V−Invert circuit

When B−Y axis of PB chroma signal is cos ω, the signal, i.e. inverted chroma signal against B−Y axis is obtained by inputting the said cos ω and 2fsc (cos 2 ωt)to multiplier to convert their frequency. The third component (cos 3 ωt) output in the above step will be rejected by BPF in later process.

V−Invert block diagram is shown in below Fig. 3−81.

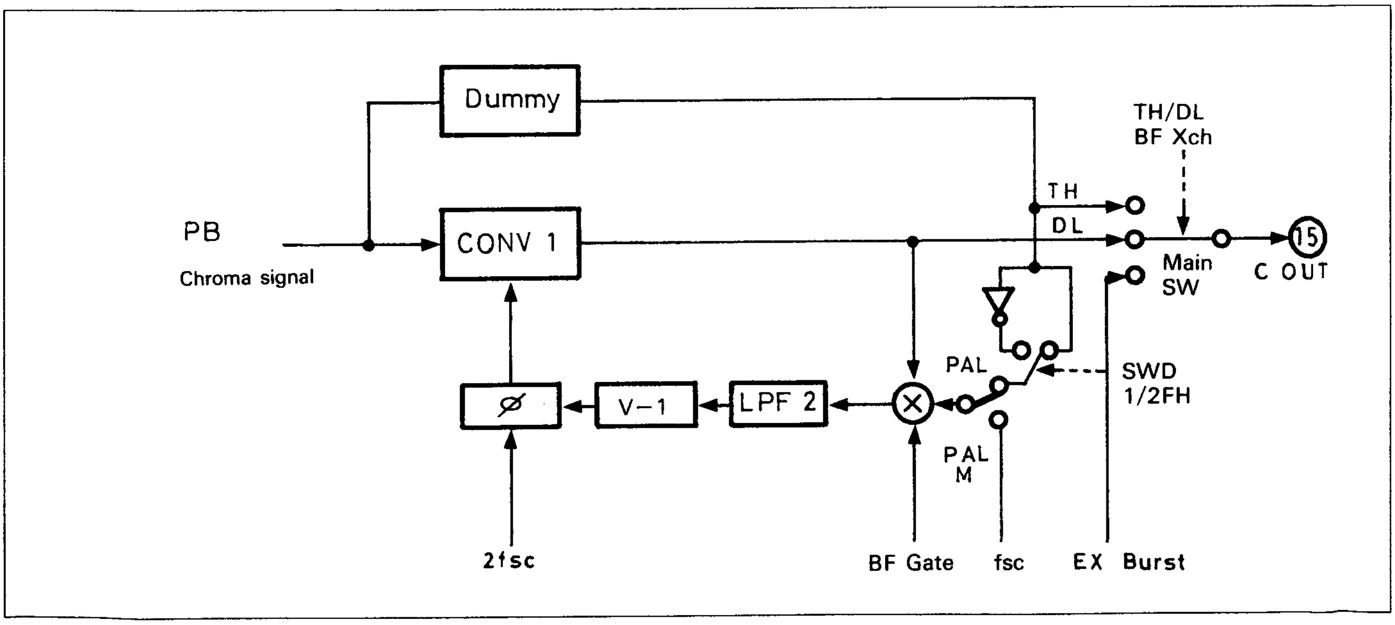

Dummy
TH/DL
BF Xch
PB
Chroma signal
CONV 1
TH
DL
Main
SW
15
C OUT
PAL
SWD
1/2FH
⌀
V−1
LPF 2
PAL
M
2fsc
BF Gate
fsc
EX
Burst

Fig. 3−81 Block diagram of V−Invert

V−Invert circuit plovides DL signal and comprises TH/DL APC loop so that burst signal of TH signal is at an angle of 90° with that of DL signal. It performs phase detection of bust signal of TH and DL signals and varies the amount of delay in phase shifter by using their error current. In PAL−M mode, APC is applied to fsc of DL signal. As the result, phase of input burst signal is at an angle of−90° with fsc. CONV 1 is a multiplier to obtain DL signal. Gain difference between TH/DL signals and phase difference are removed from Dummy by applying gain loss and phase lag produced in CONV 1 to TH signal.

Main SW provides TH or DL signal in TH/DL switch signal (the 17th terminal output). It also provides EX burst in BFX ch pulse (in JOG only).

(5) fH PLL

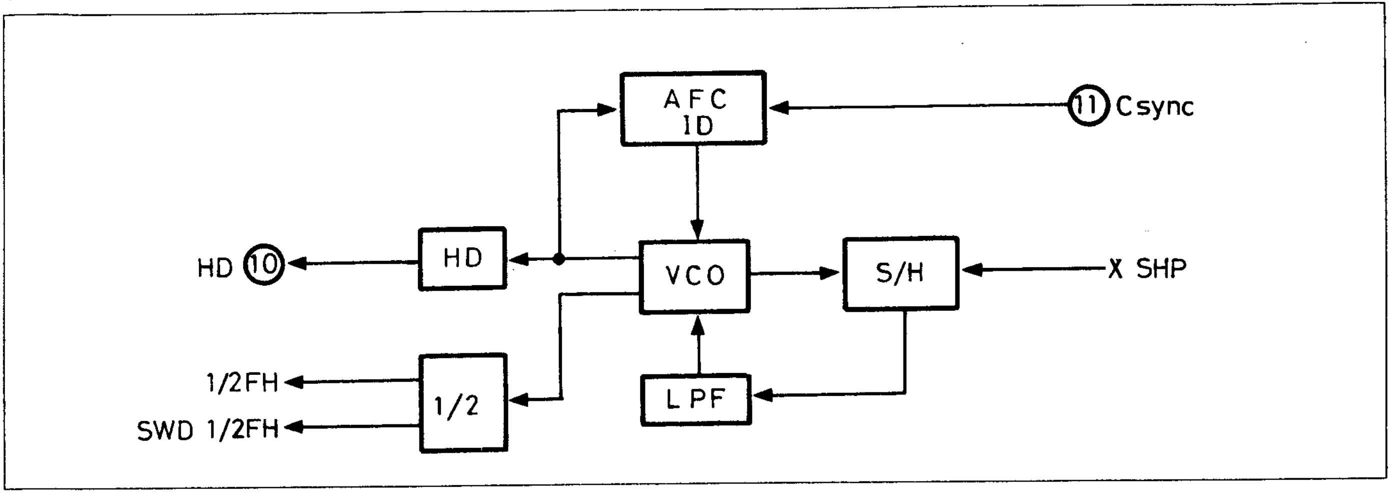


Fig. 3−82 Block diagram of fH PLL circuit

AFC ID compares frequency of C sync with that of VCO. It provides Up or Down error when their frequency are different from each oter and sets VCO frequency for around 15.625kHz. In the meantime, it checks if Up or Down error is provided for the period of 15H X 6 (=5760 μ sec) and provides AFC ID error only when Up or Down error is provided for the said period.

AFC ID also detects SYNC omission. When C sync is omitted due to variable speed playback, etc., AFC ID stops its output to restore the condition before C sync is not omitted.

Phase lock of C sync and VCO frequency is made by PLL loop consisting of S/H. LPF.

(6) Phase circuit (Outer circuit)

Phase circuit is set by inverter so as to be at an angle of −90° with fsc to which center phase of bust signal is inputted. (3)

(7) BPF (Outer circuit)

It rejects the third component (cos 3 ωt) produced in (4).

4. AUDIO CIRCUIT

4−1. General

The audio circuit is composed of ALC, record amplifier, equalizer amplifier, oscillator and switch circuits.
Only the oscillator circuit is not integrated, and the others are integrated into one-chip IC. All switch circuits are controlled by the system controller and servo circuit.

4−1−1. Record mode

The signal flow in record mode is shown in a block diagram in Fig. 4−1.
The audio signal passes through the ALC loop and record amplifier, and is superposed on the bias oscillator, and is recorded by the audio head. The bias oscillator is supplied into the full erase head, and the signals in the entire tape width are erased.

4−1−2. Play mode

The signal flow in play mode is shown in a block diagram in Fig. 4−2.
The signal picked up by the audio head is amplified by the equalizer amplifier formed in a loop, and the incoming noise f_H from the video circuit is trapped, and the level is adjusted by the reproduction gain control, and the signal is amplified by the line amplifier and delivered.

4−2. Detailed description

4−2−1. Record process

The record process is described in details below while referring to Fig. 4−3.
The signal entering from LINE IN passes through C2018, R2008, R2007, and gets into pin 25 of IC201.

C2085 ·················· Radiation preventive capacitor
C2018 ·················· Coupling capacitor
R2007, R2008 ··· Input attenuation (approx. 24 dB)

The signal entering pin 25 passes through EE mute circuit to get into ALC circuit, and then it enters the line amplifier through switch, and runs through the power on/off mute circuit to be delivered to pin 30.

EE mute circuit:
The circuit to mute the EE signal.
ALC circuit:
Depending on the ALC detection output voltage, this is to amplify small input signals, and attenuate large input signals.
SW circuit:
To change over the path between PB and EE, REC.
LINE AMP circuit: To amplify by about 33 dB.
POWER ON/OFF MUTE circuit:
To mute the buzz generated in the transient period of power on/off switching.

The signal leaving pin 30 is divided into three ways. One portion passes through the R2012, R2013, and enters record amplifier at pin 24, and the rest enters pin 29 through R2011, R010. The signal entering pin 29 detects the ALC, and this detection output is fed into the ALC circuit to control the gain.

C2010 ························ Coupling
R2012, R2013 ········· Attenuation
R2011, R2010 ········· Attenuation
C2009, R2009 ········· ALC detection filter

The signal supplied into pin 29 passes through SW, REC mute, REC equalizer amplifier, power on/off mute circuit, and is delivered from pin 20.

SW circuit : In REC, EE mode, pin 24 and REC mute circuit are coupled.
REC MUTE circuit : To mute in REC mode.
REC EQ AMP circuit : An equalizer amplifier of about 57 dB.
L2002, R2014, C2013 : REC equalizer filter (REC emphasis)
C2025 : Equalizer filter in 12H mode REC

The record current is emphasized by the REC equalizer amplifier. In 12H mode, the switch at pin 7 is turned on through C2025, and the amount of emphasis varies (Fig. 4−4).
The record current delivered from pin 20 passes through C2016, C2018, and is mixed with bias current, and is supplied into the audio head to be recorded.
The high signal showing the REC mode applied to pin 2 causes the SW in the IC to be changed to the REC side. By the switch at pin 1 side, a voltage is applied to the current protector, from which a voltage is delivered to pin 1. The voltage at pin 1 passes through R2021, L2003, and is applied to the bias oscillation circuit, so that bias oscillation is effected.
The bias oscillation circuit is partly superposed on the audio record signal, while the rest is supplied to the full erase head as erasing current.

C2016 : Coupling capacitor
R2018 : Attenuation
R2021 : Protective resistance
L2003 : Noise filter

T2001, C2019, R2022, C2022, } Bias oscillation
R2023, C2023, R2024, Q2001 } circuit
C2020 : Coupling capacitor
VR201 : Bias adjusting VR
C2021 : Decoupling capacitor
R2001 : Resistance for measurement of bias current

SW circuit at pin 1 side :
To change over the power source between REC mode and EE, PB mode.

Current protector circuit :
When an excessive current flows in the bias oscillation circuit, a control signal to turn off the switch is delivered.

SW switch at pin 9 side : To ground in REC mode.

4-2-2. Control signals

The following five control signals enter the audio circuit. Their functions are described below.

REC H pin 2 input : High signal in record mode
ON level : 3.8-6V
R2019, C2028 ········· Noise filter
D2001··· Diode for discharge so as to change the mode quickly from REC ON to OFF.

PB H pin 10 input : High signal in play mode
ON level : 3.3-6V
R2027, R2017 ·········Noise filter

AUDIO MUTE pin 12 input : High signal in mute mode
ON level : 3.3-12V
R2016, C2075 ·········Noise filter
OFF level:0-1.0
D2002 ··················For increasing speed of mute

12 H mode H pin 14 input : 12H mode H : 3.0-6.0V
R2026, C2031 ·········Noise filter

24H mode H pin 18 input :H in 24H mode
ON level : 3.0-6.0V
R2027, C2025 ·········Noise filter

The state of control signals is shown in Table 4-1.

	In record mode				In playback mode						
	2H	12H	24H	48-960H	2H	12H	24H	48-960H	CUE/REV	REVERSE	STILL/ADV
REC "H"	H	H	H	H	L	L	L	L	L	L	L
PB "H"	L	L	L	L	H	H	H	H	H	H	H
AUDIO MUTE	L	L	L	H	L	L	L	H	H	H	H
12H "H"	L	H	L	L	L	H	L	L	L	L	L
24H "H"	L	L	H	L	L	L	H	L	L	L	L

Table 4-1 State of audio input control signals

4-2-3. Playback process

In playback, pin 4 SW is grounded, and one end of the head is also grounded, while the other is sent out from pin 2 of CN201, and gets into pin 15 by way of R2001, C2001.

The signal entering pin 15 runs through the equalizer amplifier and C2006, R2006, and adjusts the playback gain at VR202, C2008, and gets into pin 23.

EQ AMP circuit : The playback equalizer amplifier for amplifying about 72 dB.

C2001 : Coupling capacitor

C2002, C2032 : Input matching capacitor

R2004, R2005, C2007
C2005, R2003 } : Equalizer filter

C2004, VR203 : Adjustment of 12, 24H playback level

C2011, VR204 : Adjustment of 24H playback level

C2006 : Coupling capacitor

R2006 : Attenuation

C2008, VR202 : Adjustment of playback level

The signal entering pin 23 passes through PB mute, SW, line amplifier power on/off mute circuits to reach pin 30, and then runs through C2010 and is delivered to AD OUT.

PB mute circuit : The mute circuit in playback mode.

Playback level adjustment of 2, 12, 24H

The sequence of adjustment of output levels is ① VR202 2H mode R/P, ② VR203 12H mode R/P, ③ VR204 24H mode R/P.

The reason is that as the playback speed is slower, the playback level becomes smaller, and it is necessary to raise the gain, and it is also because of control signal of pin 13 switch and pin 26 switch. The on/off state of two switches depending on mode is shown in Table 4-2.

	2H	12H	24H
13 pin SW	OFF	ON	ON
26 pin SW	OFF	OFF	ON
Playback level adjusting VR	VR202	VR202 VR203	VR202 VR203 VR204

Table 4-2 Selection of adjustment VR by playback mode

Buzzer Output

Buzzer goes on the on-screen program. Set any of the three to "Y" and AD OUT to "Y", and then BUZZER is output through AUDIO LINE output. Q7506 and Q2002 change the bias as analog switch to output BUZZER.

4-3. MIC AMP

4-3-1. Amplification of audio signal

Audio input signal is input as shown in Fig. 4-6. When the microphone is used, the signal is delivered through the microphone to JK221 No. 2 pin, and to IC221 No. 4 pin through C2202. The signal is amplified 48.6 dB through OP AMP to be output from No. 2 pin. The output signal from No. 2 pin is divided to IC221 No. 6 pin through R2203, and to JK221 No. 6 pin through C2201. The signal input to JK221 No. 6 pin is delivered to CN221 No. 11 pin through JK221 No. 3 pin. When the microphone is not used, the audio signal from JK222 is input to JK221 No. 3 pin through C2208 and JK221 No. 5 pin. It is amplified hereinafter in the same way as above.

4-3-2. Audio sensor circuit

Fig. 4-7 shows the flow of audio sensor circuit signals. The audio signal input from MIC is amplified in AMP, and is compared with the detected level decided by VR222 in IC221 to output.

The output signal is invertingly output through 1 SHOT M. M circuit or INTEGRATION circuit to AUDIO SENSOR terminal at the back of the video unit. S7502 SW is on the cassette insersion in the video unit. 1 SHOT mode or INTEGRATION mode can be selected by switching to left or right respectively.

The frequency characteristic diagram in each mode is shown in Fig. 4-6.

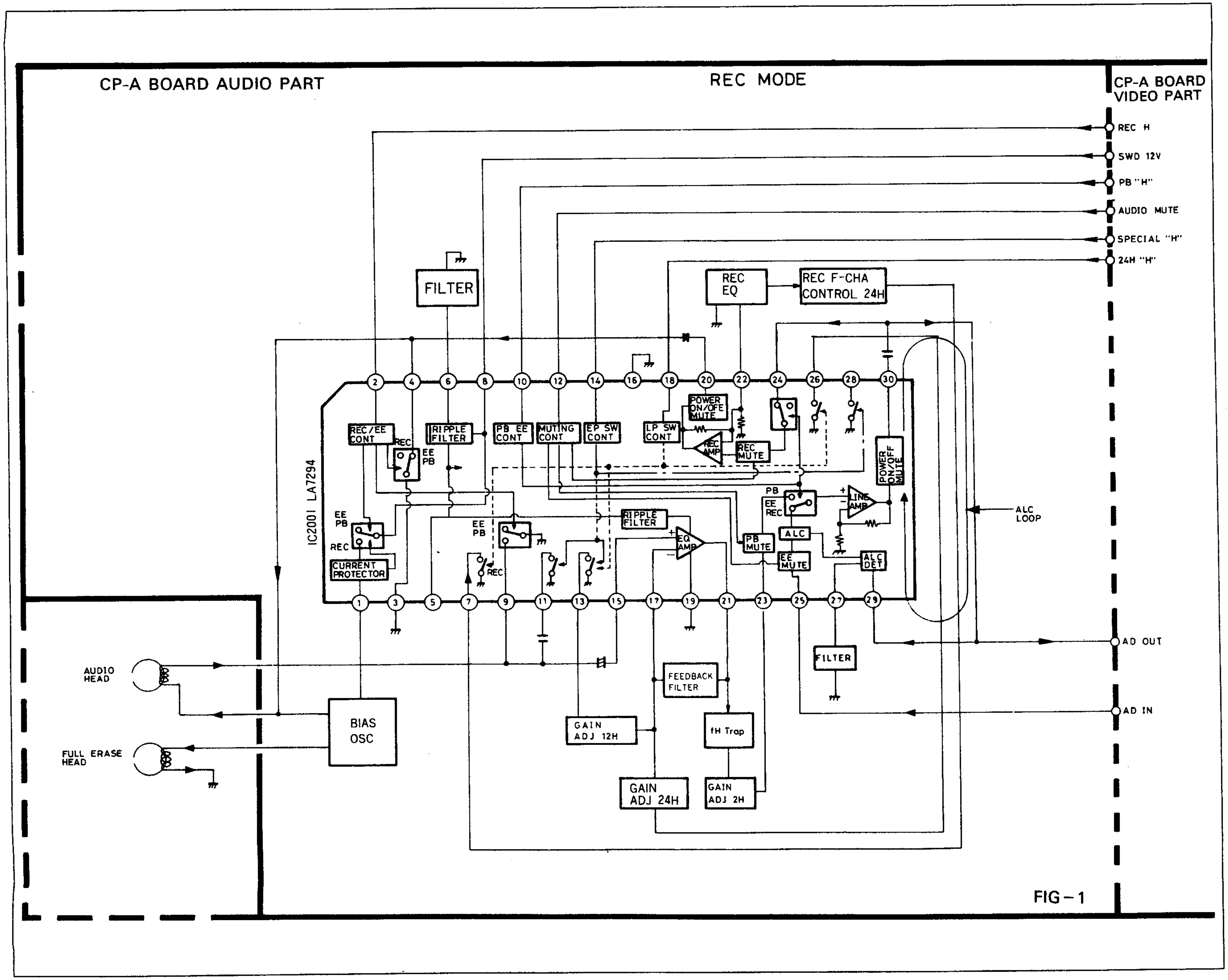

CP-A BOARD AUDIO PART
REC MODE
CP-A BOARD VIDEO PART
REC H
SWD 12V
PB "H"
AUDIO MUTE
SPECIAL "H"
24H "H"
FILTER
REC EQ
REC F-CHA CONTROL 24H
IC2001 LA7294
REC/EE CONT
REC
EE
PB
RIPPLE FILTER
PB EE CONT
MUTING CONT
EP SW CONT
LP SW CONT
POWER ON/OFF MUTE
REC AMP
REC MUTE
POWER ON/OFF MUTE
LINE AMP
ALC
ALC DET
EE MUTE
PB MUTE
EQ AMP
RIPPLE FILTER
CURRENT PROTECTOR
ALC LOOP
AD OUT
AD IN
FILTER
FEEDBACK FILTER
fH Trap
GAIN ADJ 12H
GAIN ADJ 24H
GAIN ADJ 2H
BIAS OSC
AUDIO HEAD
FULL ERASE HEAD
FIG-1

Fig. 4-1 Audio Circuit Block Diagram

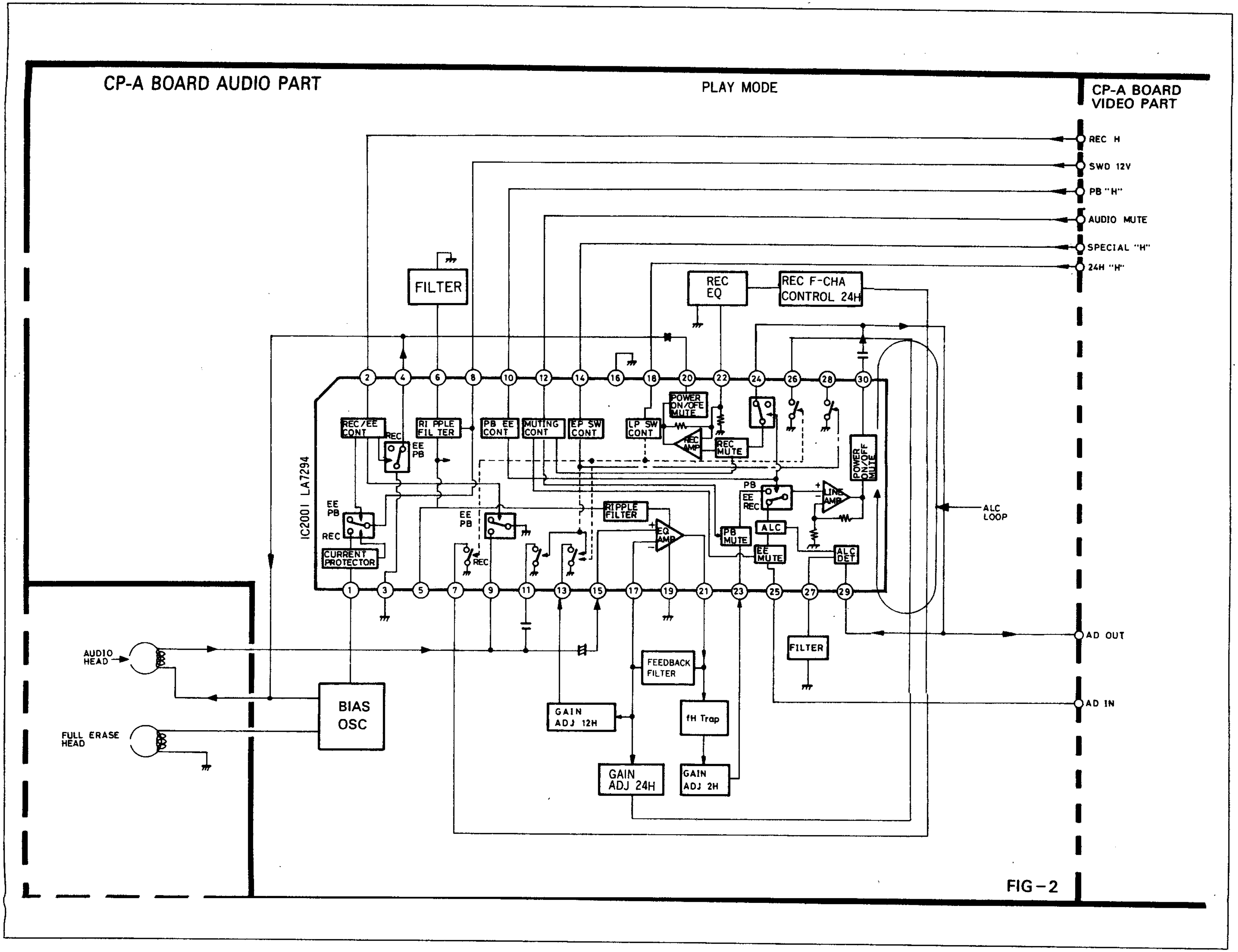

CP-A BOARD AUDIO PART
PLAY MODE
CP-A BOARD VIDEO PART
REC H
SWD 12V
PB "H"
AUDIO MUTE
SPECIAL "H"
24H "H"
FILTER
REC EQ
REC F-CHA CONTROL 24H
IC2001 LA7294
REC/EE CONT
REC
EE
PB
RIPPLE FILTER
PB EE CONT
MUTING CONT
EP SW CONT
LP SW CONT
POWER ON/OFF MUTE
REC AMP
REC MUTE
POWER ON/OFF MUTE
LINE AMP
ALC LOOP
EE PB REC
CURRENT PROTECTOR
RIPPLE FILTER
EQ AMP
PB MUTE
EE MUTE
ALC
ALC DET
PB EE REC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
AUDIO HEAD
FULL ERASE HEAD
BIAS OSC
FEEDBACK FILTER
GAIN ADJ 12H
fH Trap
GAIN ADJ 24H
GAIN ADJ 2H
FILTER
AD OUT
AD IN
FIG-2

Fig. 4-2 Audio Circuit Block Diagram

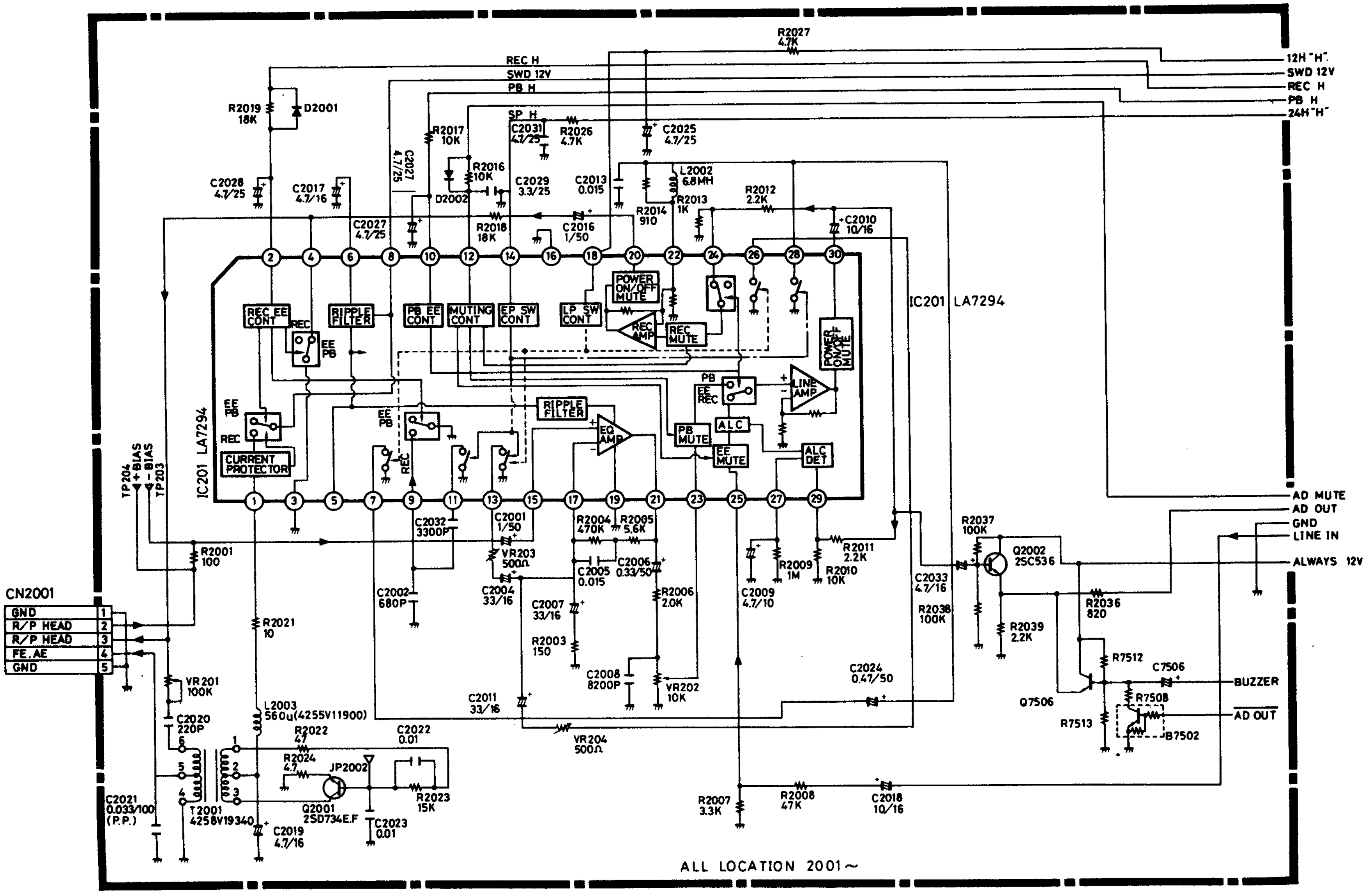

CN2001
GND 1
R/P HEAD 2
R/P HEAD 3
FE. AE 4
GND 5
IC201 LA7294
REC EE CONT
RIPPLE FILTER
PB EE CONT
MUTING CONT
EP SW CONT
LP SW CONT
POWER ON/OFF MUTE
REC AMP
REC MUTE
LINE AMP
PB MUTE
ALC
ALC DET
EE MUTE
EQ AMP
CURRENT PROTECTOR
REC H
SWD 12V
PB H
SP H
12H "H"
24H "H"
AD MUTE
AD OUT
GND
LINE IN
ALWAYS 12V
BUZZER
AD OUT
R2027 4.7K
R2019 18K
D2001
R2017 10K
R2016 10K
D2002
R2018 18K
C2031 4.7/25
R2026 4.7K
C2025 4.7/25
L2002 6.8MH
R2013 1K
R2014 910
R2012 2.2K
C2010 10/16
C2013 0.015
C2016 1/50
C2029 3.3/25
C2027 4.7/25
C2028 4.7/25
C2017 4.7/16
TP204 + BIAS
- BIAS TP203
R2001 100
C2032 3300P
C2001 1/50
VR203 500Ω
C2004 33/16
C2002 680P
R2004 470K
R2005 5.6K
C2005 0.015
C2006 0.33/50
R2006 2.0K
C2007 33/16
R2003 150
C2008 8200P
VR202 10K
C2009 4.7/10
R2009 1M
R2010 10K
R2011 2.2K
C2033 4.7/16
R2037 100K
R2038 100K
Q2002 2SC536
R2036 820
R2039 2.2K
R7512
C7506
R7508
B7502
Q7506
R7513
C2024 0.47/50
C2011 33/16
VR204 500Ω
R2021 10
VR201 100K
C2020 220P
L2003 560u(4255V11900)
R2022 47
R2024 4.7
JP2002
C2022 0.01
R2023 15K
Q2001 2SD734E.F
C2023 0.01
C2019 4.7/16
T2001 4258V19340
C2021 0.033/100 (P.P.)
R2007 3.3K
R2008 47K
C2018 10/16
ALL LOCATION 2001~

Fig. 4-3 REC mode

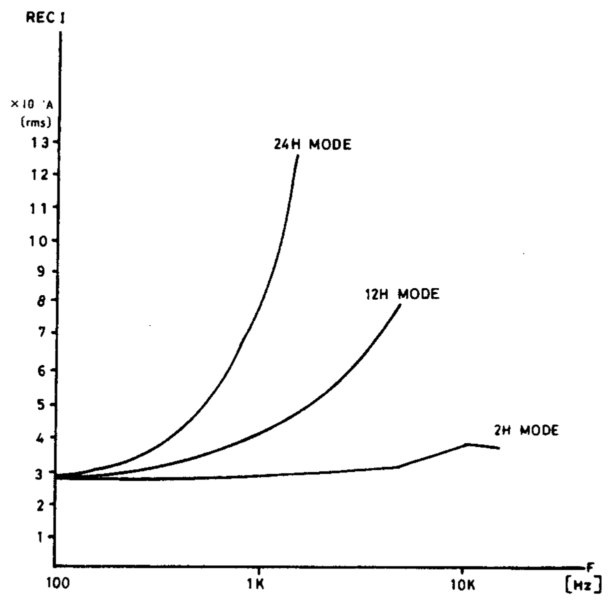


Fig. 4-4 Audio Rec Current Characteristic

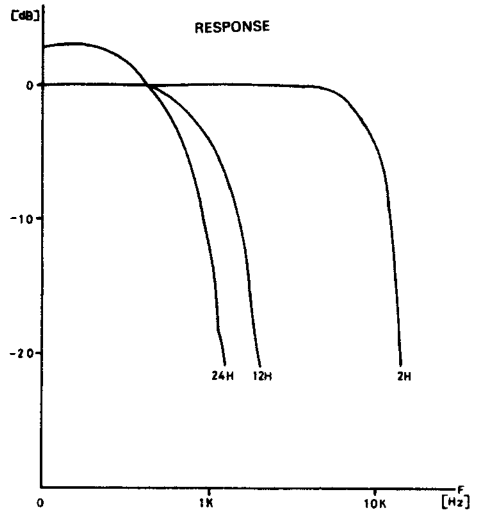


Fig. 4-5 Audio R/P Frequency Characteristic

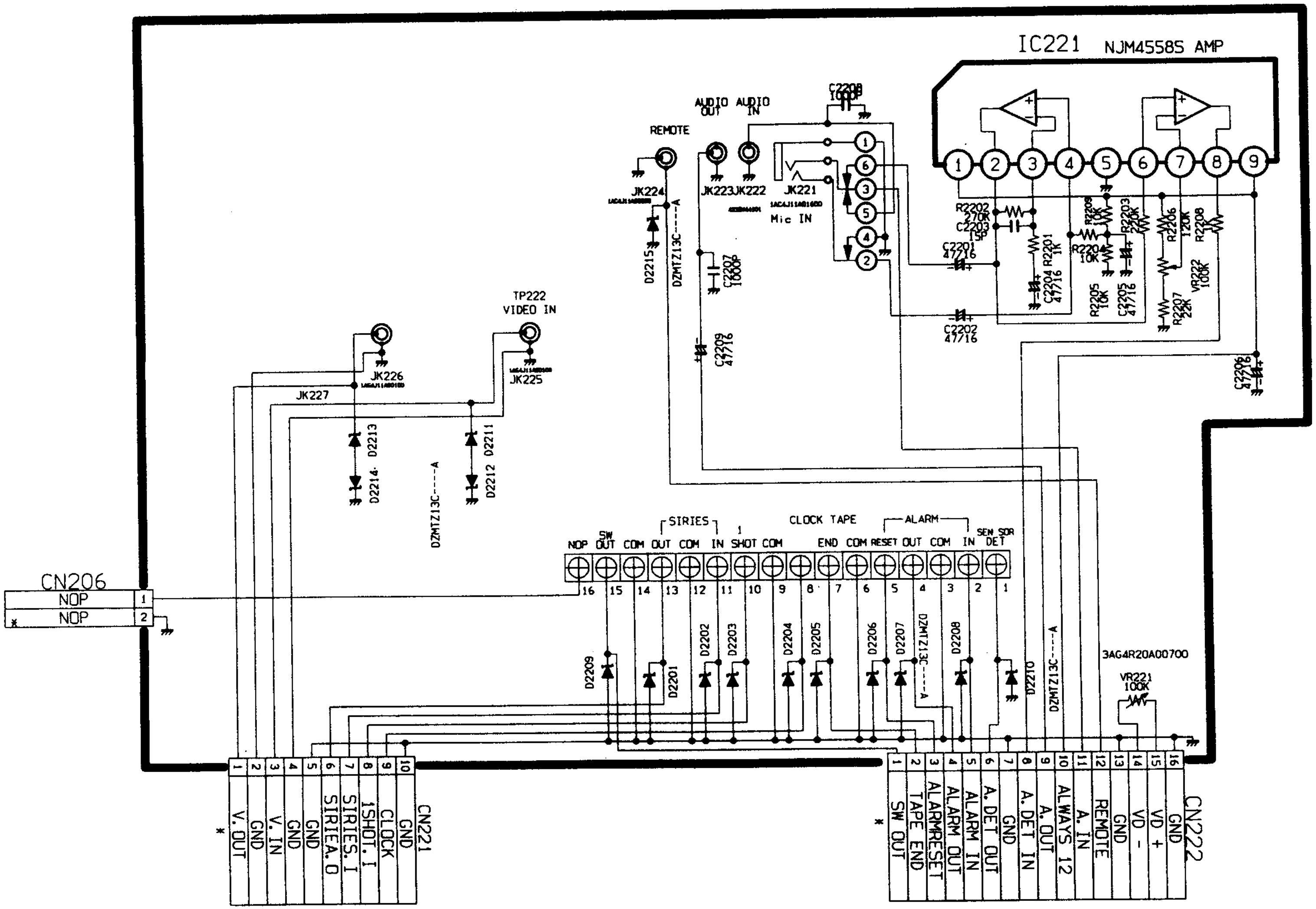

IC221 NJM4558S AMP
AUDIO OUT
AUDIO IN
C2208 1000P
REMOTE
JK224
JK223
JK222
JK221
Mic IN
D2215
DZMTZ13C---A
C2207 1000P
C2209 47/16
R2202 270K
C2203 15P
R2201 1K
C2201 47/16
C2204 47/16
R2209 10K
R2204 10K
R2203 220K
R2205 10K
C2205 47/16
R2206 120K
R2207 22K
R2208 1K
VR222 100K
C2202 47/16
C2206 47/16
TP222
VIDEO IN
JK226
JK225
JK227
D2213
D2214
D2211
D2212
DZMTZ13C---A
SIRIES
1 SHOT
CLOCK
TAPE
ALARM
NOP
SW OUT
COM
OUT
COM
IN
COM
END
COM
RESET
OUT
COM
IN
SEN SOR DET
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
CN206
1 NOP
2 NOP
D2209
D2201
D2202
D2203
D2204
D2205
D2206
D2207
D2208
D2210
DZMTZ13C---A
3AG4R20A00700
VR221 100K
CN221
1 V.OUT
2 GND
3 V.IN
4 GND
5 GND
6 SIRIEA.O
7 SIRIES.I
8 1SHOT.I
9 CLOCK
10 GND
CN222
1 SW OUT
2 TAPE END
3 ALARMRESET
4 ALARM OUT
5 ALARM IN
6 A.DET OUT
7 GND
8 A.DET IN
9 A.OUT
10 ALWAYS 12
11 A.IN
12 REMOTE
13 GND
14 VD -
15 VD +
16 GND

Fig. 4-6

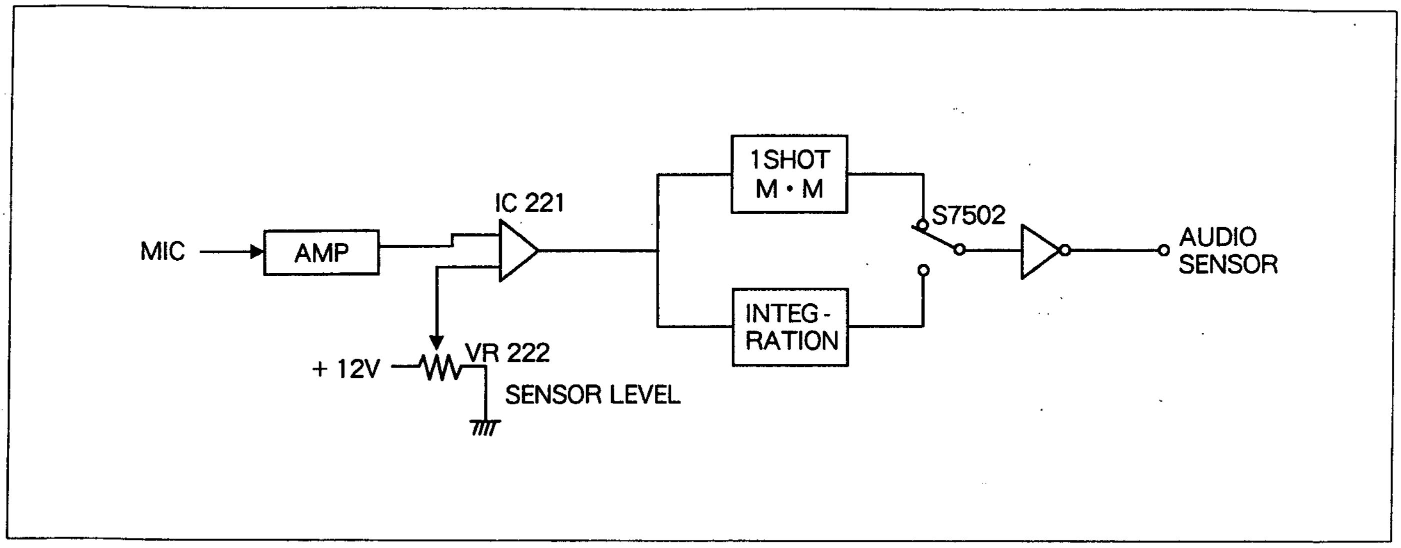

MIC
AMP
IC 221
+ 12V
VR 222
SENSOR LEVEL
1SHOT
M • M
INTEG-
RATION
S7502
AUDIO
SENSOR

Fig. 4-7

5.SERVO CIRCUIT

5−1. General

Basic circuit of rotation control (servo) circuit for the drum motor and capstan motor is made up of a digital servo IC (IC351) with control data ROM incorporated and IC for amplifying control signal (IC353). It also includes a gate array IC (IC352) in order to cope with 1 field slow and several IC's in the peripheral circuits. Basic servo control circuit is made up of speed control and phase control circuits and the motor driving voltage is produced by mixing the two control signals obtained here. This servo control enables the stable recording and playback picture. For the speed control, the control error voltage is obtained by comparing the frequency of FG signal which is the motor rotation information with the set frequency data in ROM incorporated in the IC. On the oter hand, for the phase control, the control error voltage is obtained by comparing the PG signal and FG signal which are the motor rotation information or CTL playback signal phase and counting the difference between the time difference of the above and the set time difference data in the ROM incorporated in IC. The error voltages for speed control and phase control are mixed by the differential amplifier and supplied to motor driving circuit as servo driving voltage for each motor.

5−2. Major IC's

① IC351 (LC7418-8553)
This IC is CMOS-LSI for digital servo control with ROM incorporated. Therefore, by specifying ROM address in Servo Mode data externally, characteristics of servo control can be freely changed. The following is the internal functions of this IC.

* Internal functions of IC

- Drum speed/Phase control (ROM incorporated)
- Capstan speed/Phase control (ROM incorporated)
- Generation of reference signal for phase control (ROM incorporated)
- Mode control with 16-bit serial data
- Recording/playback control of the control signal
- Automatic recognition of tape speed for playback ······Not used with this Model
- Division of control signal and capstan FG signal at the time of special playback
- Processing of drum PG signal
- Circuit for generating quasi vertical synchronizing signal (V_D) at the time of special playback
- Switching signal generation for Hi-Fi head······Not used with this Model
- Generation of 4-head control signal
- Timing control for noiseless intermittent driving slow

② IC352(LC9108B-385)
This is the gate array IC for 1 field intermittent slow control provided with the following functions.

- Generation of head change signal
- Generation of quasi CTL-P
- Generation of quasi vertical synchronizing signal
- Production of Mode power supply
- Generation of capstan control signal

③ IC353 (LA7124)
This is the IC with various amplifiers incorporated for servo interface provided with the following functions.

- FG amplifier
- PG amplifier
- OP amplifier for mixing servo voltage
- Amplifier for CTL recording/playback

④ IC354, (BU4538B)
This is the IC with two mono-multivibrator incorporated, which is used for generating various correction pulses when playing back 48-960H.

⑤ IC355, 358 (BU4053B)
This is the IC with three 2-channel multiplexors/demultiplexors incorporated, which is used as changeover switch for various signals.

⑥ IC356, 363 (BU4030B)
This is the IC with four exclusive OR gates incorporated, which is used as inverter and multiply circuit of signal.

⑦ IC357 (MLC4013B)
This is the IC with two D-FF incorporated. which is used for 1/2 frequency division of capstan FG signal.

⑧ IC359 (MLC4520B)
This is the IC with two 4-bit binary counters incorporated, which is used for generating quasi CTL signal by counting capstan FG signal when recording 48 -960H.

⑨ IC361 (LC74HC10)
This is the IC with three 3-input NAND gates incorporated.

⑩ IC362 (MLC4066B)
This is the IC with four analog switches, which is used as changeover switch for various signals.

5−3. Operation of major IC's

5−3−1. Digital servo IC (IC351)······Fig. 5−1

Hereunder is described the major functions.

(1) Mode control (Fig. 5−2, Table. 5−1)
This IC selects the address in the incorporated ROM (drum speed system, drum phase system, capstan speed system, capstan phase system, REF generator, special playback divider)

according to the 4-bit data in various operation modes input from the system control circuit so that the servo control most appropriate for the specified mode is performed.

In the capstan phase system, the input of reference signal and the comparison signal is selected according to the mode.

〔Block diagram IC351 : LC7418〕

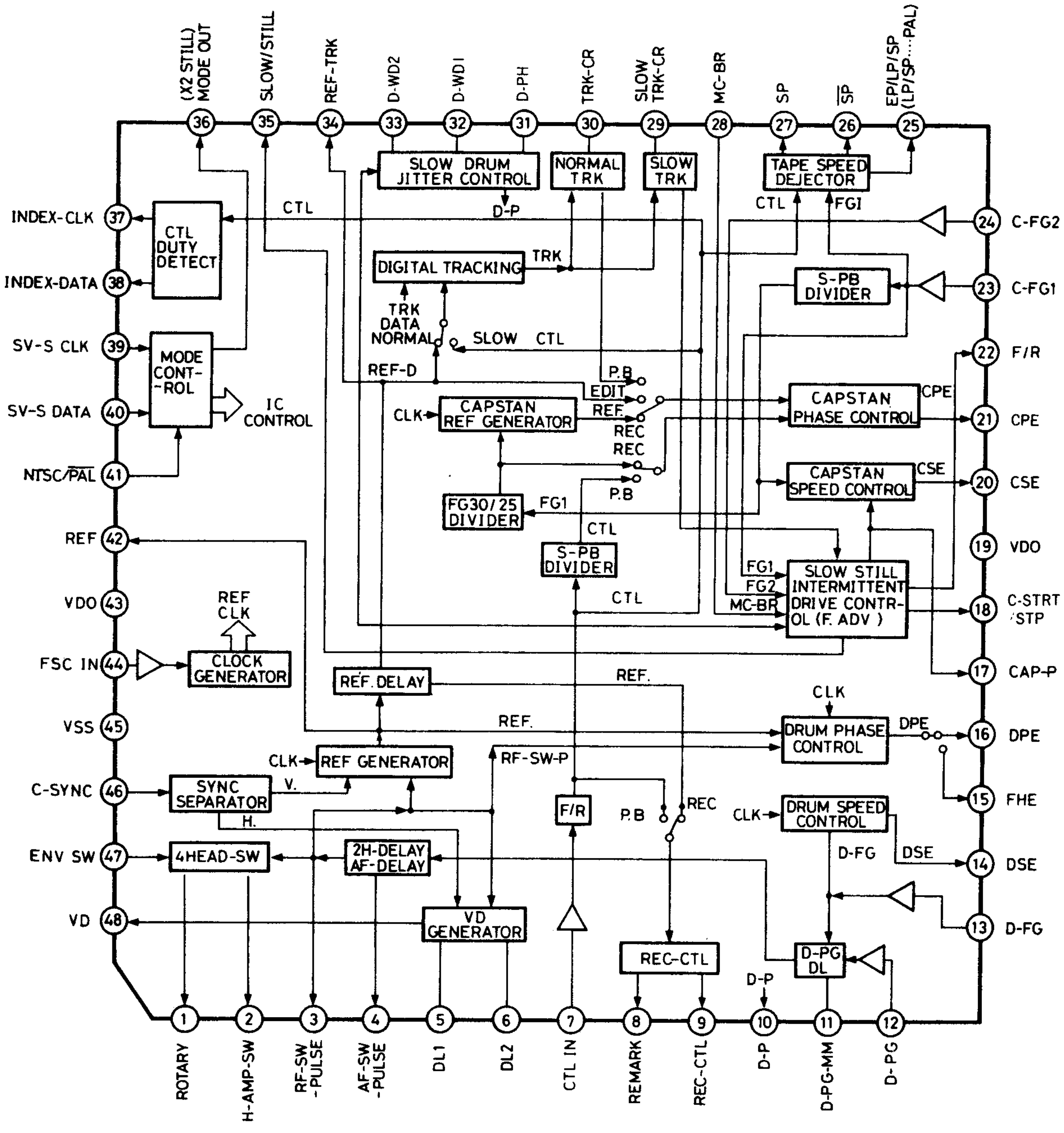

(X2 STILL) MODE OUT
SLOW/STILL
REF-TRK
D-WD2
D-WDI
D-PH
TRK-CR
SLOW TRK-CR
MC-BR
SP
SP
EP/LP/SP (LP/SP...PAL)
36
35
34
33
32
31
30
29
28
27
26
25
SLOW DRUM JITTER CONTROL
NORMAL TRK
SLOW TRK
TAPE SPEED DEJECTOR
D-P
CTL
FGI
24
C-FG2
INDEX-CLK
37
CTL DUTY DETECT
INDEX-DATA
38
DIGITAL TRACKING
TRK
S-PB DIVIDER
23
C-FG1
TRK DATA
NORMAL
SLOW
CTL
SV-S CLK
39
MODE CONT-ROL
22
F/R
REF-D
P.B
EDIT
SV-S DATA
40
IC CONTROL
CLK
CAPSTAN REF GENERATOR
REF
REC
REC
CAPSTAN PHASE CONTROL
CPE
21
CPE
NTSC/PAL
41
P.B
CAPSTAN SPEED CONTROL
CSE
20
CSE
FG30/25 DIVIDER
FG1
CTL
REF
42
S-PB DIVIDER
19
VDO
FG1
FG2
MC-BR
SLOW STILL INTERMITTENT DRIVE CONTR-OL (F. ADV)
VDO
43
REF CLK
CTL
18
C-STRT /STP
FSC IN
44
CLOCK GENERATOR
REF. DELAY
REF.
17
CAP-P
CLK
VSS
45
REF.
DRUM PHASE CONTROL
DPE
16
DPE
CLK
REF GENERATOR
RF-SW-P
C-SYNC
46
SYNC SEPARATOR
V.
H.
15
FHE
F/R
P.B
REC
CLK
DRUM SPEED CONTROL
ENV SW
47
4HEAD-SW
2H-DELAY AF-DELAY
D-FG
DSE
14
DSE
VD
48
VD GENERATOR
13
D-FG
REC-CTL
D-PG DL
D-P
1
2
3
4
5
6
7
8
9
10
11
12
ROTARY
H-AMP-SW
RF-SW -PULSE
AF-SW -PULSE
DL1
DL2
CTL IN
REMARK
REC-CTL
D-P
D-PG-MM
D-PG

Fig. 5−1. Block diagram of servo IC

The most appropriate data for each operation mode (STOP, REC, PB, REW, F.FWD, etc.) and each control signal is read by 16-bit serial data from the system control circuit to control the servo circuit. The 16-bit serial data includes tracking data required for digital tracking and F.ADV data required for SLOW/ STILL control.

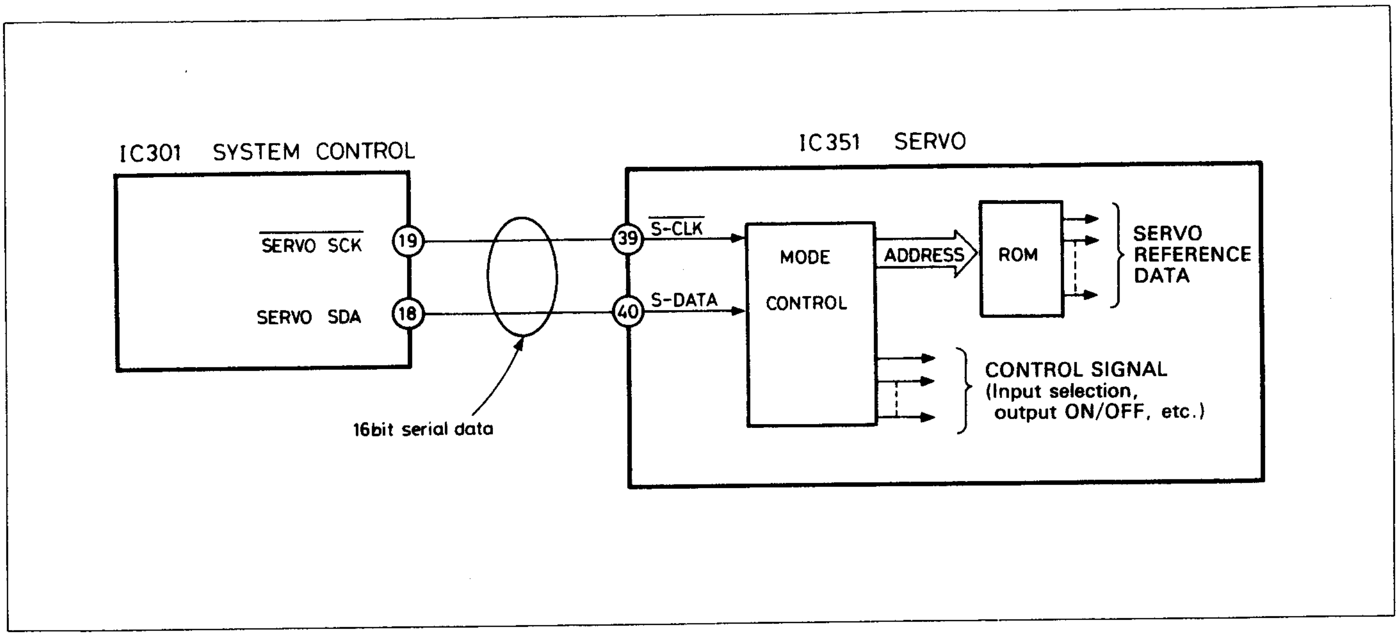

IC301 SYSTEM CONTROL
SERVO SCK
SERVO SDA
19
18
16bit serial data
IC351 SERVO
39
40
S-CLK
S-DATA
MODE CONTROL
ADDRESS
ROM
SERVO REFERENCE DATA
CONTROL SIGNAL
(Input selection, output ON/OFF, etc.)

Fig. 5-2

(1)-1. 16-bit serial data

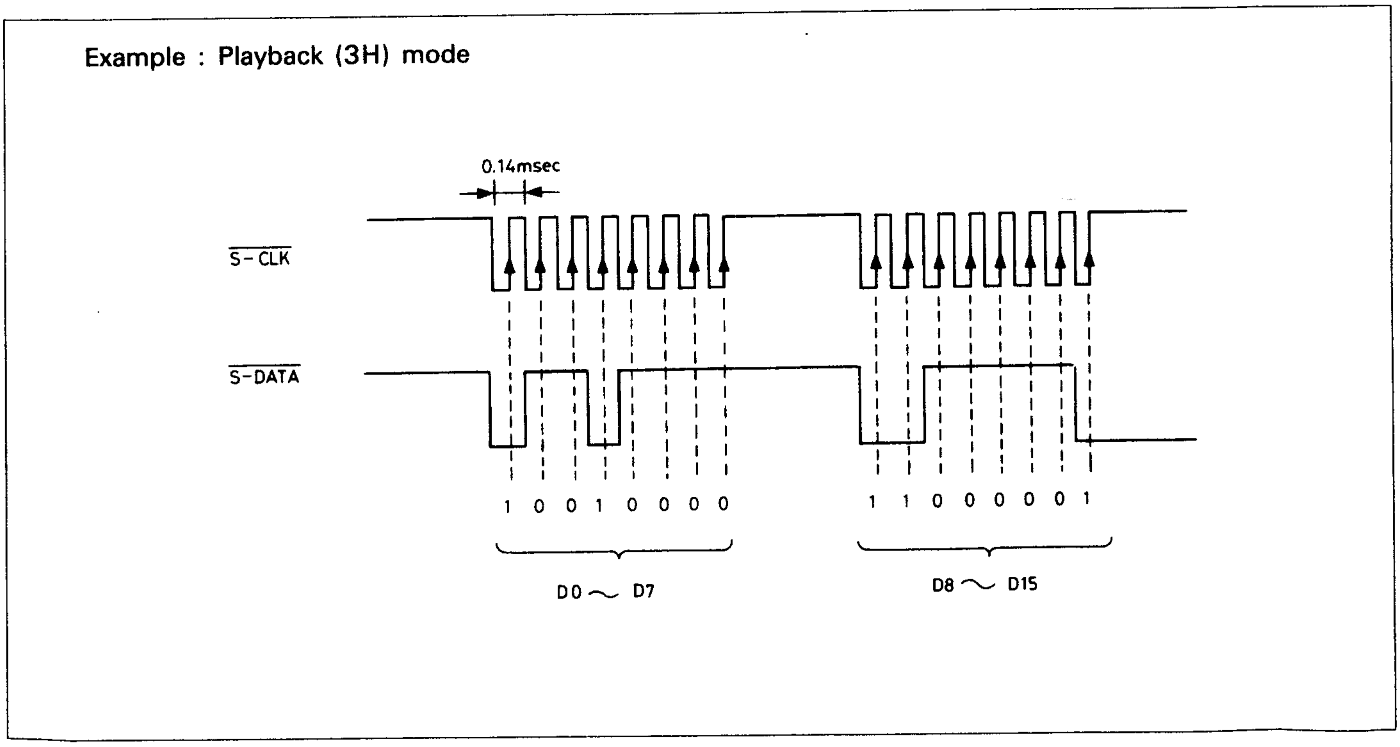

Example : Playback (3H) mode
0.14msec
S-CLK
S-DATA
1 0 0 1 0 0 0 0
1 1 0 0 0 0 0 1
D0 ~ D7
D8 ~ D15

Fig. 5-3

The format of the serial data is shown as follows :

(1)−2. SV serial input output procassing

(1) Serial data format

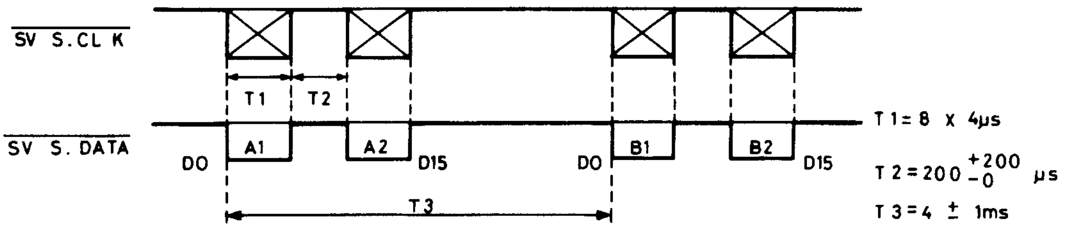

SV S.CL K
SV S. DATA
T1
T2
D0
A1
A2
D15
D0
B1
B2
D15
T3
T 1 = 8 x 4µs
T 2 = 200 +200 -0 µs
T 3 = 4 ± 1ms

Fig. 5−4

SV S. DATA (SY → SV)

		A	B
A1 B1	D0	SV MODE 0	TRK DATA 0
	D1	SV MODE 1	TRK DATA 1
	D2	SV MODE 2	TRK DATA 2
	D3	SV MODE 3	TRK DATA 3
	D4	MC-F/R	TRK DATA 4
	D5	TAPE SPEED 0	TRK DATA 5
	D6	TAPE SPEED 1	TRK DATA 6
	D7	TAPE SPEED 2	TRK SLOW/NORM
A2 B2	D8	MC-ON	0 / I
	D9	MH-ON	REMARK
	D10	ENV-ON	HIGH (Fixed)
	D11	VD-ON	HIGH (Fixed)
	D12	HIGH (Fixed)	HIGH (Fixed)
	D13	F. ADV P	HIGH (Fixed)
	D14	HIGH (Fixed)	HIGH (Fixed)
	D15	LOW (Fixed)	HIGH (Fixed)

Note : Signal-0 is the lowest bit.

Table. 5−1

(2) Head drum (DRUM) servo

〔Drum speed error〕

The cycle of 13-pin input DRUM FG signal is measured to detect SPEED error to output in PWM signal to 14-pin.

〔Drum phase error〕

13-pin input DRUM FG signal and 12-pin input DRUM PG signal generate SW30 signal to compare phase with REF30 signal from REF counter, which is output to 16-pin in PWM signal. REFERENCE counter is synchronous with the vertical synchronizing signal in recording.

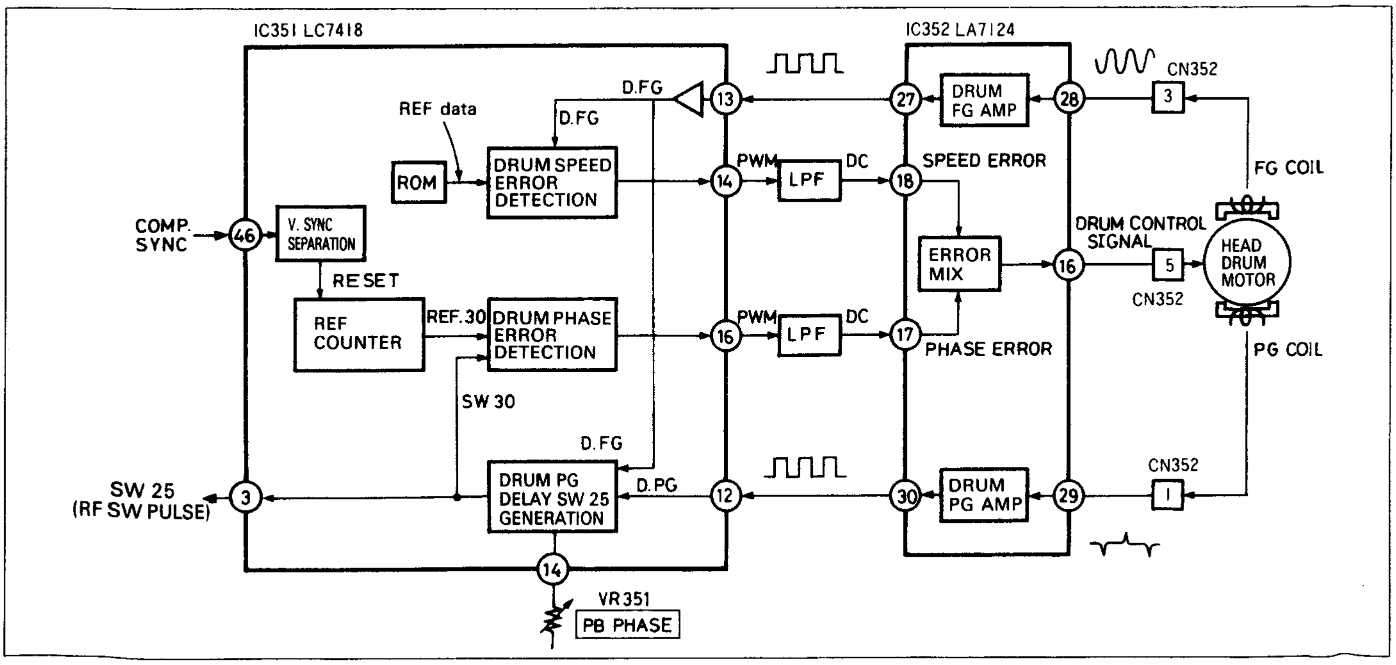

IC351 LC7418
IC352 LA7124
D.FG
REF data
D.FG
ROM
DRUM SPEED ERROR DETECTION
COMP. SYNC
46
V. SYNC SEPARATION
RESET
REF COUNTER
REF.30
DRUM PHASE ERROR DETECTION
SW 30
D.FG
SW 25 (RF SW PULSE)
3
DRUM PG DELAY SW 25 GENERATION
D.PG
14
VR351
PB PHASE
13
14
16
12
PWM
LPF
DC
PWM
LPF
DC
27
DRUM FG AMP
28
18
SPEED ERROR
ERROR MIX
16
17
PHASE ERROR
30
DRUM PG AMP
29
CN352
3
FG COIL
DRUM CONTROL SIGNAL
5
CN352
HEAD DRUM MOTOR
PG COIL
CN352
1

Fig. 5−5

(2)−1. Drum FG AMP

This shapes waveform of drum FG signal (30 waves/ 1 rotation = 750 Hz) generated in drum FG coil into square wave.

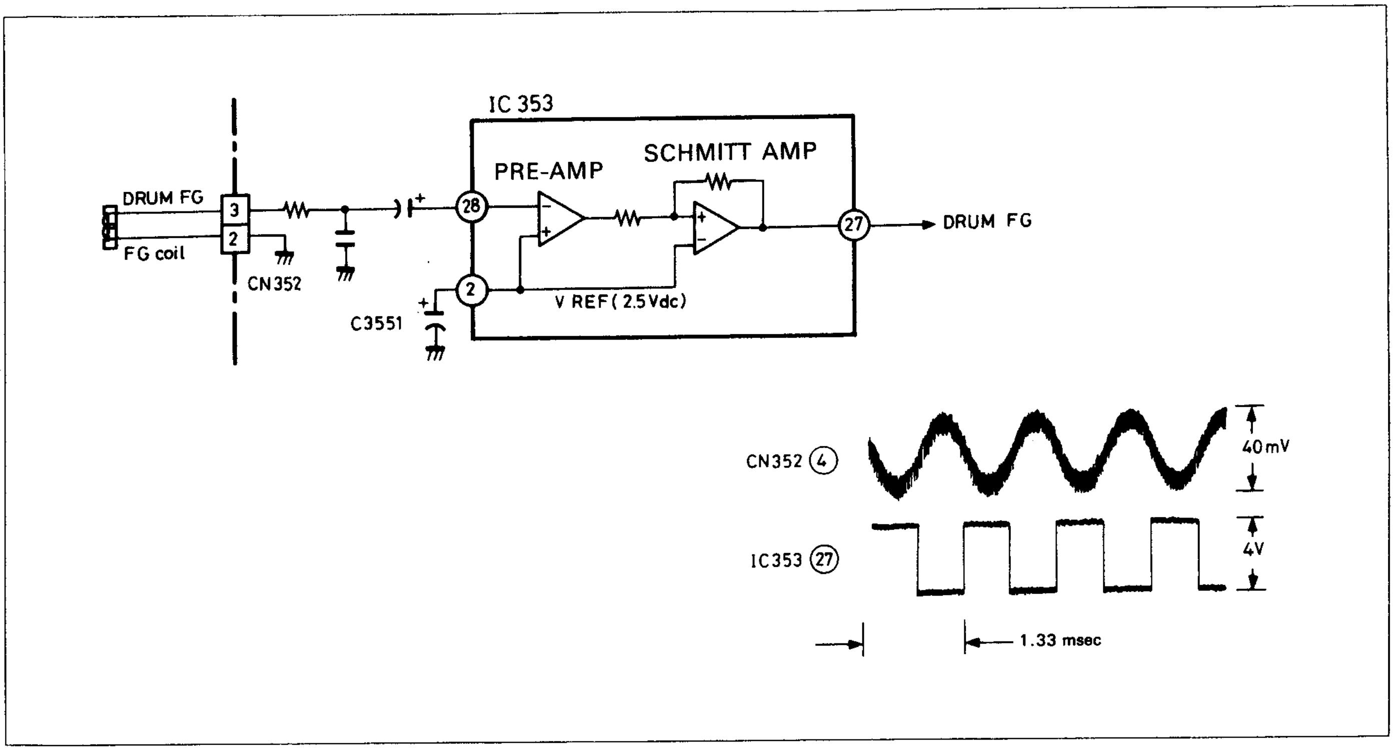

IC 353
PRE-AMP
SCHMITT AMP
DRUM FG
FG coil
3
2
CN352
28
2
27
C3551
V REF (2.5Vdc)
DRUM FG
CN352 ④
IC353 ㉗
40mV
4V
1.33 msec

Fig. 5−6

(2)−2. Drum PG AMP

This shapes waveform of drum PG signal (40msec cycle = 25 Hz) generated in drum PG coil into square wave.

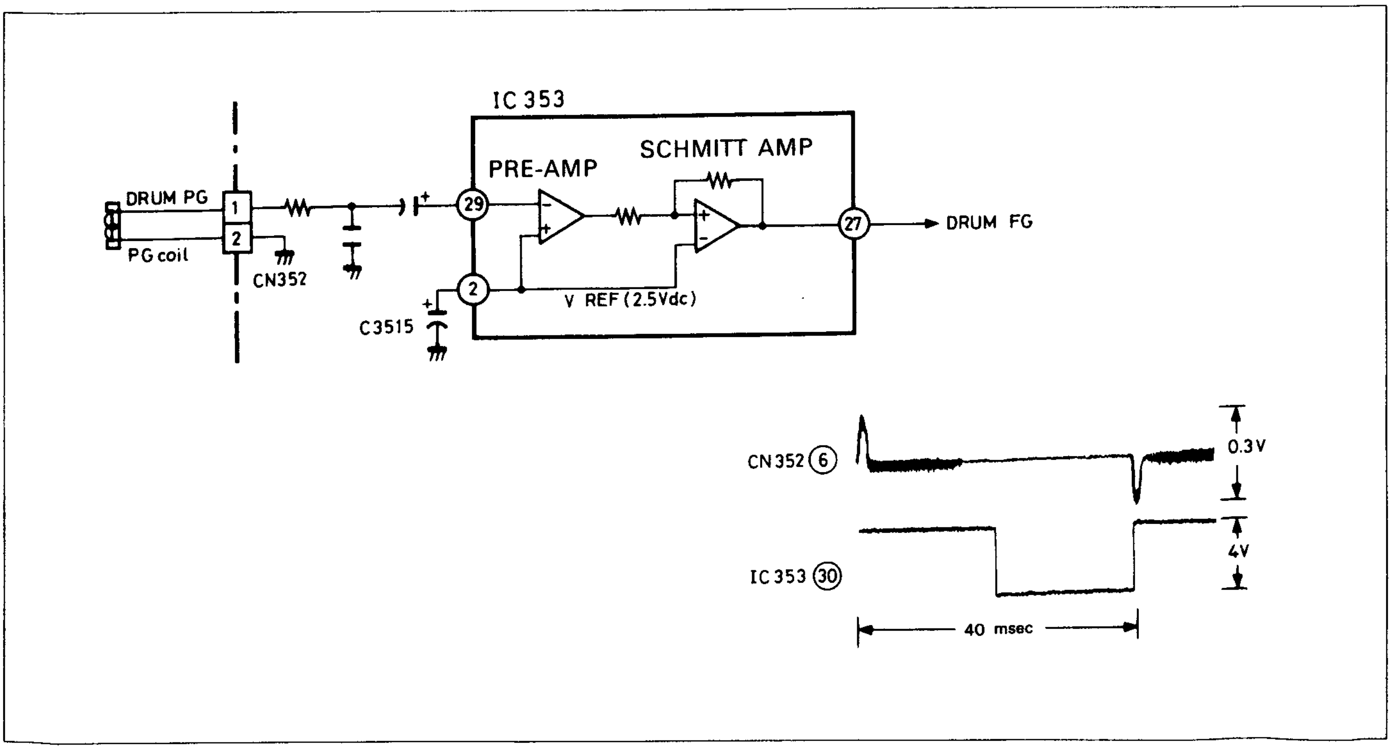

IC 353
PRE-AMP
SCHMITT AMP
DRUM PG
PG coil
1
2
CN352
29
2
27
C3515
V REF (2.5Vdc)
DRUM FG
CN352 ⑥
IC 353 ㉚
0.3V
4V
40 msec

Fig. 5−7

(2)−3. Detection of drum speed error

This detects the cycle of drum FG signal. Drum speed error is output from 14-pin in 8.7 kHz PWM signal. PWM signal changes according to the drum speed as follows :

Drum rotation speed	Drum FG signal cycle	PWM signal duty
fast	1.33msec and less	50 % and less
Normal	1.33msec	50 %
slow	1.33msec and more	50 % and more

Table. 5−2

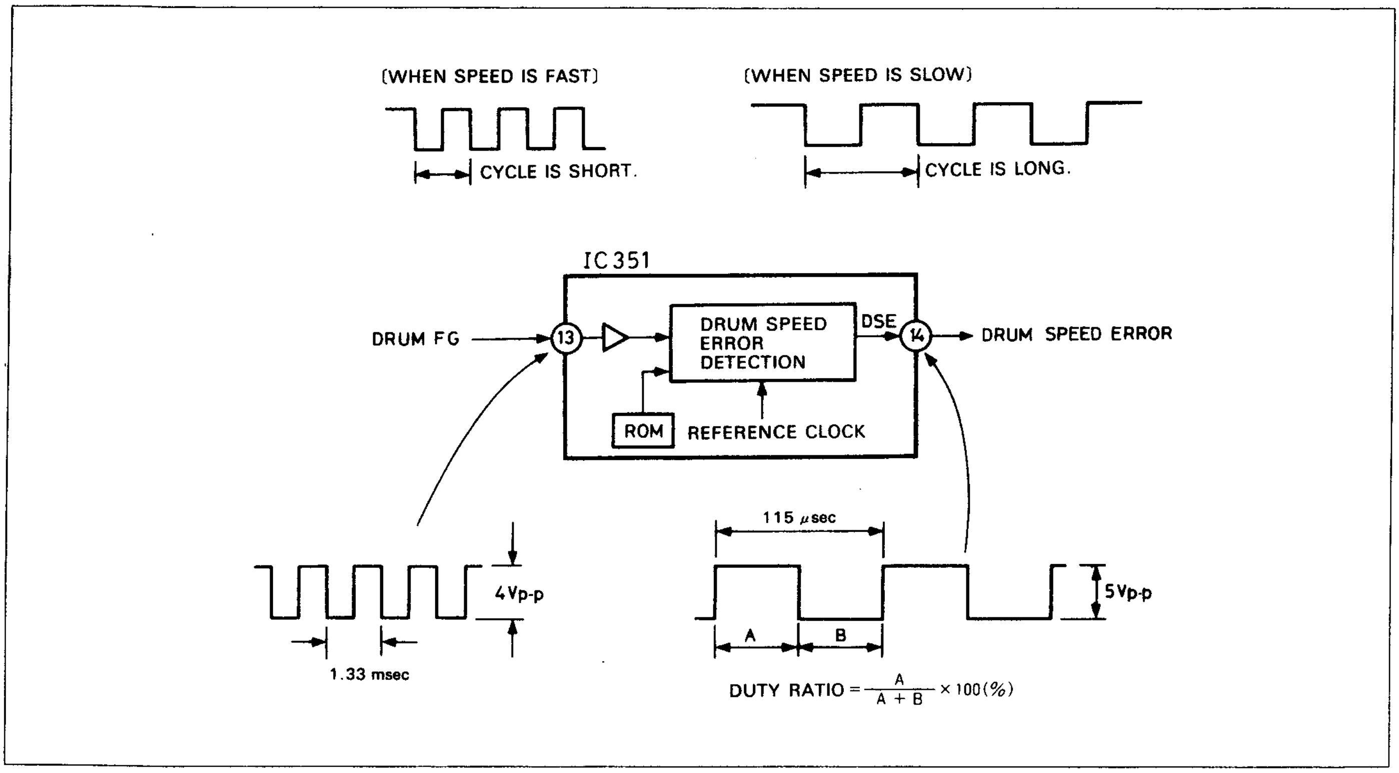

(WHEN SPEED IS FAST)
CYCLE IS SHORT.
(WHEN SPEED IS SLOW)
CYCLE IS LONG.
IC351
DRUM FG
13
DRUM SPEED ERROR DETECTION
DSE
14
DRUM SPEED ERROR
ROM
REFERENCE CLOCK
4Vp-p
1.33 msec
115 μsec
5Vp-p
A
B
DUTY RATIO = A / (A + B) × 100(%)

Fig. 5−8

(2)−4. Detection of drum phase error

DRUM PG signal and DRUM FG signal generate SW25 signal to compare phase with REF 25 signal from REFERENCE counter to detect drum phase error. Drum phase error is output from 16-pin in 4.3 kHz PWM signal. PWM signal changes according to drum phase error as follows :

Phase of SW25 for reference signal	DRUM phase error data	PWM duty
Large phase	More than reference	50 % and more
Equal	Equal to reference	50 %
Small phase	Less than reference	50 % and less

Table. 5−3

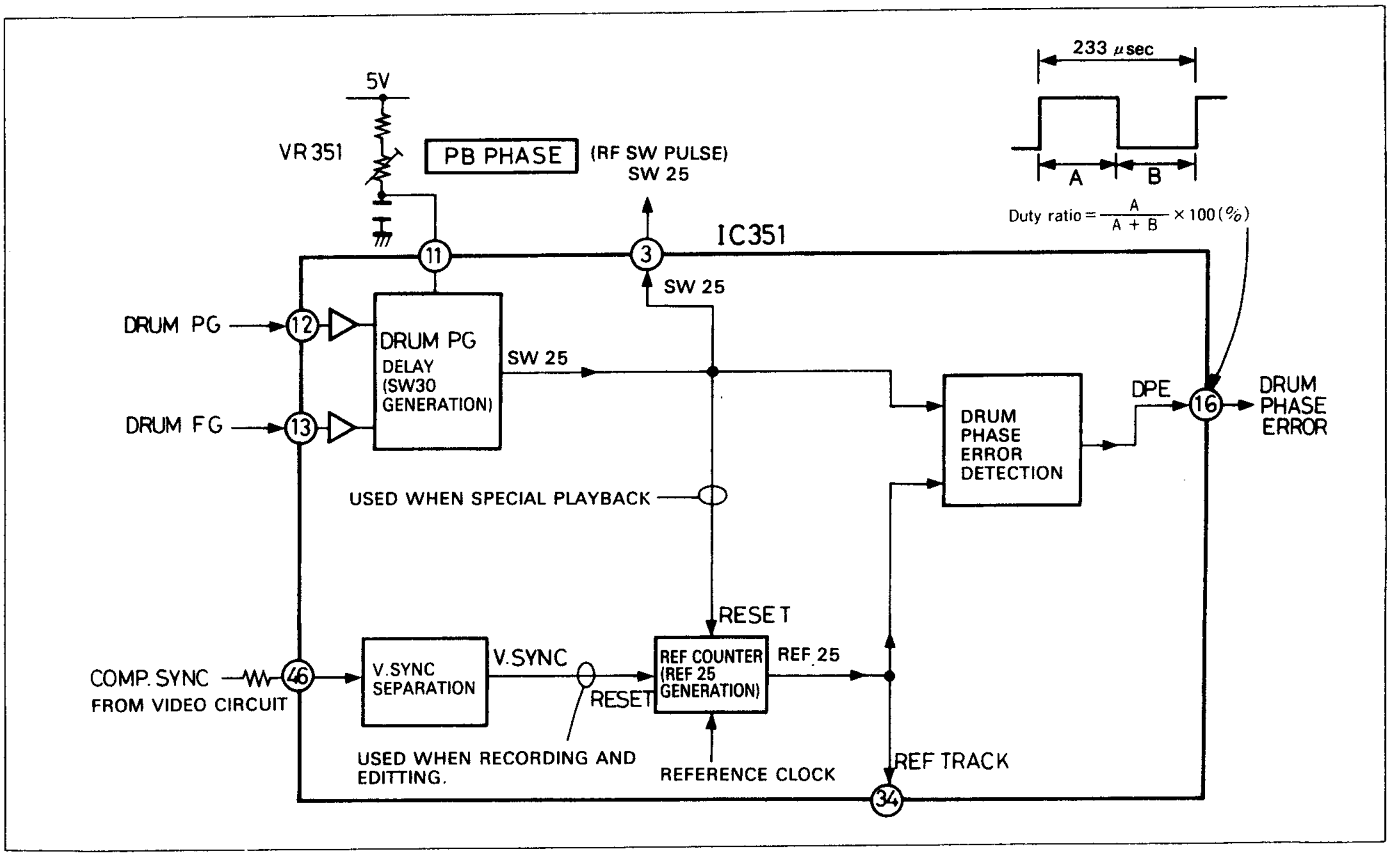
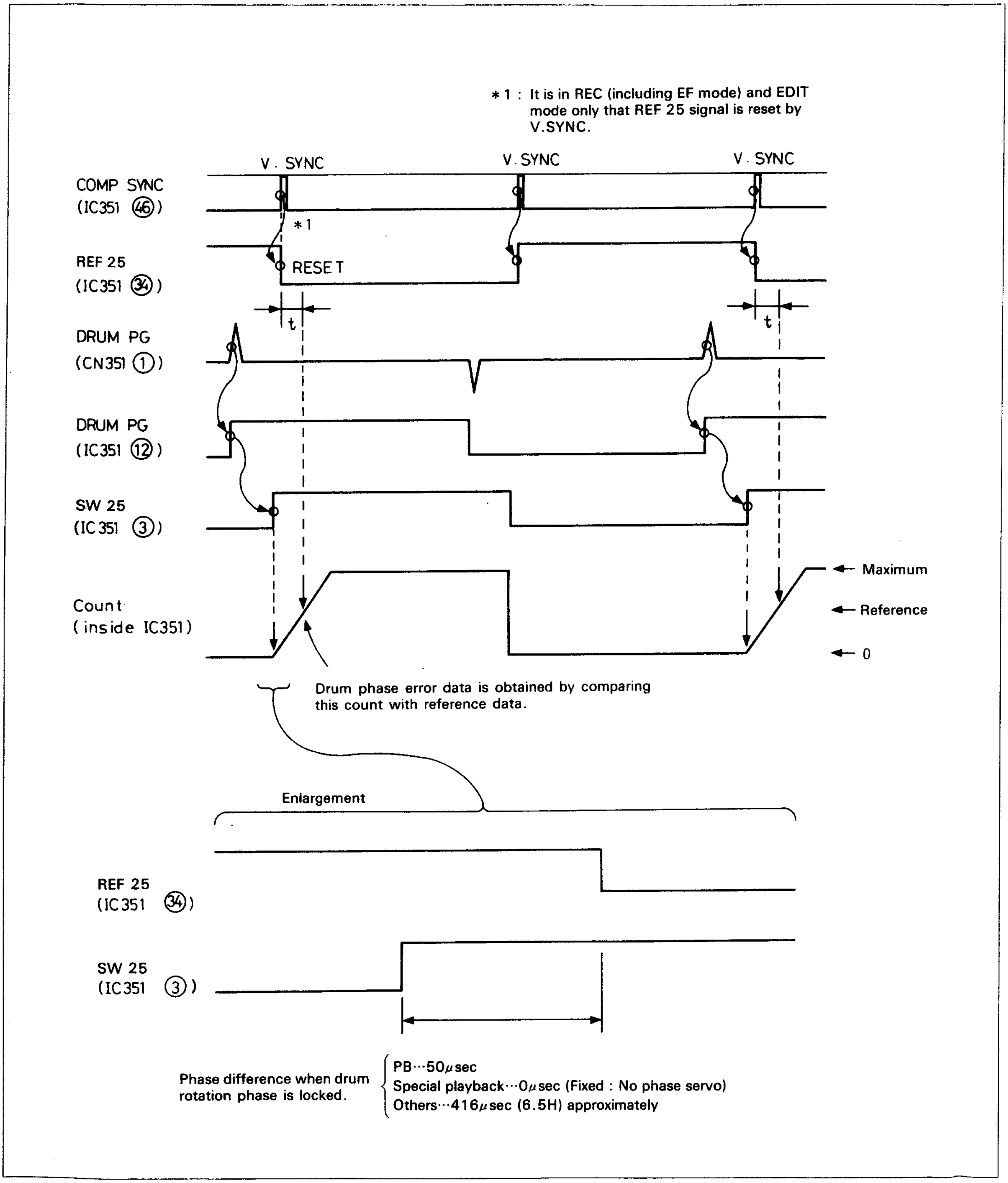

233 μsec
A
B
Duty ratio = A / (A + B) × 100(%)
5V
VR351
PB PHASE
(RF SW PULSE)
SW 25
IC351
11
3
SW 25
DRUM PG
12
DRUM FG
13
DRUM PG
DELAY
(SW30
GENERATION)
SW 25
DRUM
PHASE
ERROR
DETECTION
DPE
16
DRUM
PHASE
ERROR
USED WHEN SPECIAL PLAYBACK
RESET
COMP. SYNC
FROM VIDEO CIRCUIT
46
V.SYNC
SEPARATION
V.SYNC
RESET
REF COUNTER
(REF 25
GENERATION)
REF 25
USED WHEN RECORDING AND
EDITTING.
REFERENCE CLOCK
REF TRACK
34

Fig. 5−9


V. SYNC
V. SYNC
V. SYNC
COMP SYNC (IC351 ㊻)
*1
REF 25 (IC351 ㉞)
RESET
t
t
DRUM PG (CN351 ①)
DRUM PG (IC351 ⑫)
SW 25 (IC351 ③)
Count (inside IC351)
Maximum
Reference
0
Enlargement
REF 25 (IC351 ㉞)
SW 25 (IC351 ③)

*1 : It is in REC (including EF mode) and EDIT mode only that REF 25 signal is reset by V.SYNC.

Drum phase error data is obtained by comparing this count with reference data.

Phase difference when drum rotation phase is locked.
- PB···50μsec
- Special playback···0μsec (Fixed : No phase servo)
- Others···416μsec (6.5H) approximately

Fig. 5-10

〔Supplementary description〕

(1) Generation of SW25 signal

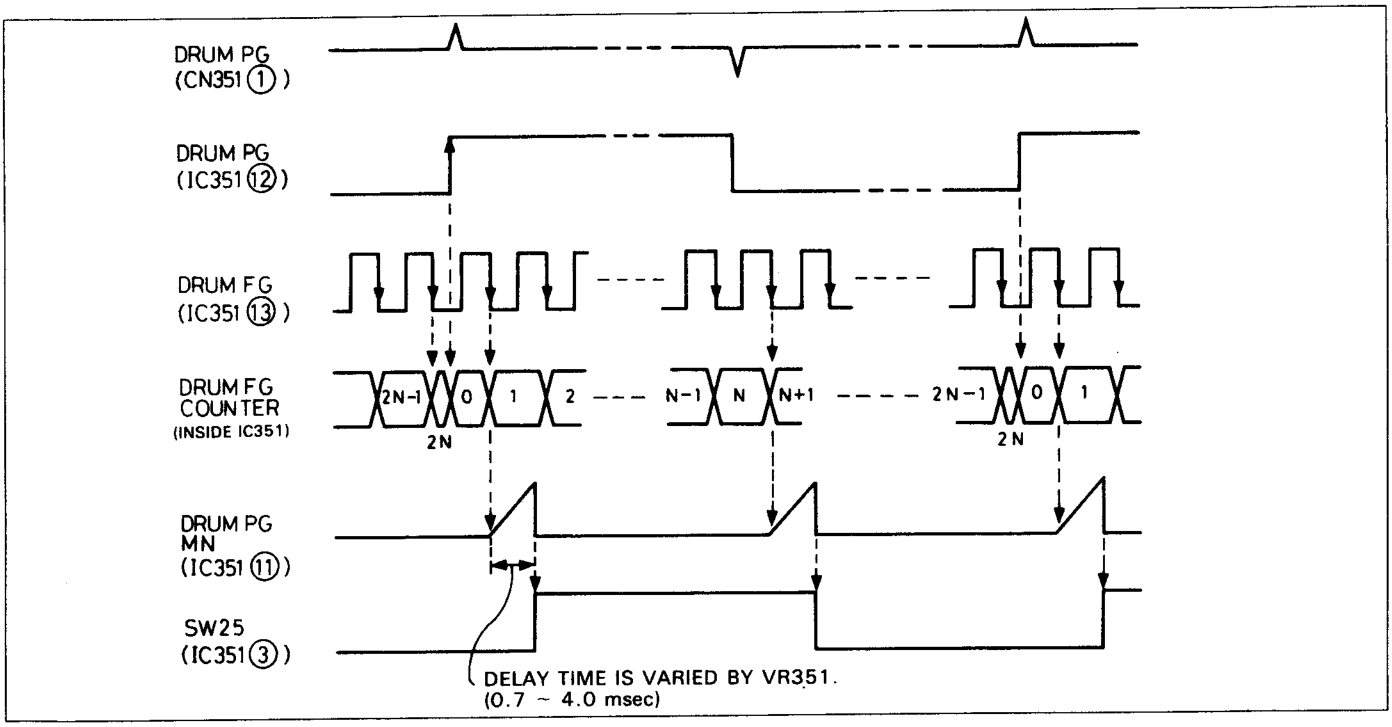
The circuit to generate SW25 signal is made up of digital counter and analog MMV.

Digital counter :

It is counted up at the falling (↓) of DRUM FG signal (pulse), and reset at the rising (↑) of DRUM PG signal (pulse).

Analog MM :

Delay circuit for adjusting switching position. It is triggered when digital count changes 0 → 1 or N → N + 1. The constant depends on CR connected to 11-pin. MM output (this is SW25 signal, and RFSWPULSE) changes L → H at the count 0 → 1, and H → L at the count N → N + 1.


DRUM PG (CN351 ①)
DRUM PG (IC351 ⑫)
DRUM FG (IC351 ⑬)
DRUM FG COUNTER (INSIDE IC351)
2N-1
0
1
2
N-1
N
N+1
2N-1
0
1
2N
2N
DRUM PG MN (IC351 ⑪)
SW25 (IC351 ③)

DELAY TIME IS VARIED BY VR351. (0.7 ~ 4.0 msec)

Fig. 5-11

(2) Generation of REF 25 signal

REF 25 signal is generated by counting the reference clock by 25 Hz pulse signal inverting in 20msec cycle.

- **In REC**

REF counter is reset by V.SYNC signal separated from input video signal, and simultanously REF counter output (REF 25) is inverted.

It is designed so that the operation may be stable even if with no V.SYNC or with noise. In the case there is no input of V.SYNC at all, the maximum REF counter is set to the clock number of 20msec cycle like in PLAYBACK. Therefore, REF 25 signal inverts in 20msec cycle.

- **In PLAYBACK**

REF counter reset input (V.SYNC signal input) is prohibited. REF counter counts clock, and returns to 0 when it reaches to the maximum set for PLAYBACK mode. The maximum is set to the clock numberof 20msec cycle, and REF 25 signal inverts in 20msec cycle.

- **In special PLAYBACK**

REF counter is reset at rising (↑) and falling (↓) of SW25 signal. Therefore, SW25 signal and REF 25 signal agrees in phase. (They are, however, reversed in polarity.)

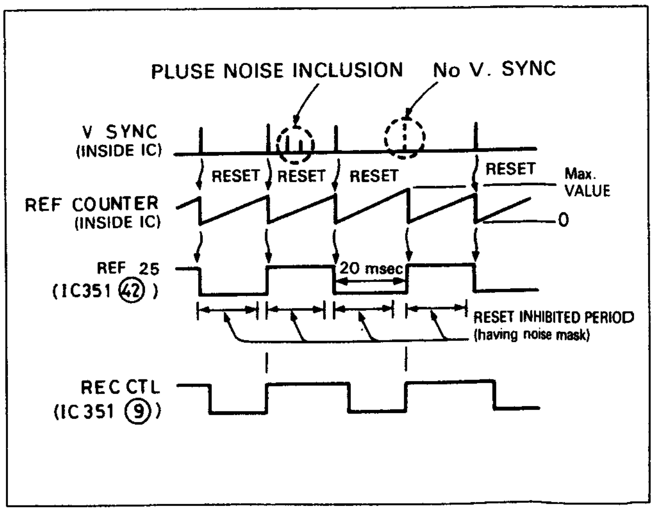

PLUSE NOISE INCLUSION
No V. SYNC
V SYNC (INSIDE IC)
RESET
RESET
RESET
RESET
Max. VALUE
0
REF COUNTER (INSIDE IC)
REF 25 (IC351 ㊷)
20 msec
RESET INHIBITED PERIOD (having noise mask)
REC CTL (IC351 ⑨)

Fig. 5-12

(2)−5. LPF and drum servo error mix AMP

1) LPF

Drum error signal is output in PWM signal, and changed to DC error signal by LPF.

2) Error mix AMP

Drum speed error signal smoothed by LPF and drum phase error signal are mixed to generate drum motor control signal (MH Vs).

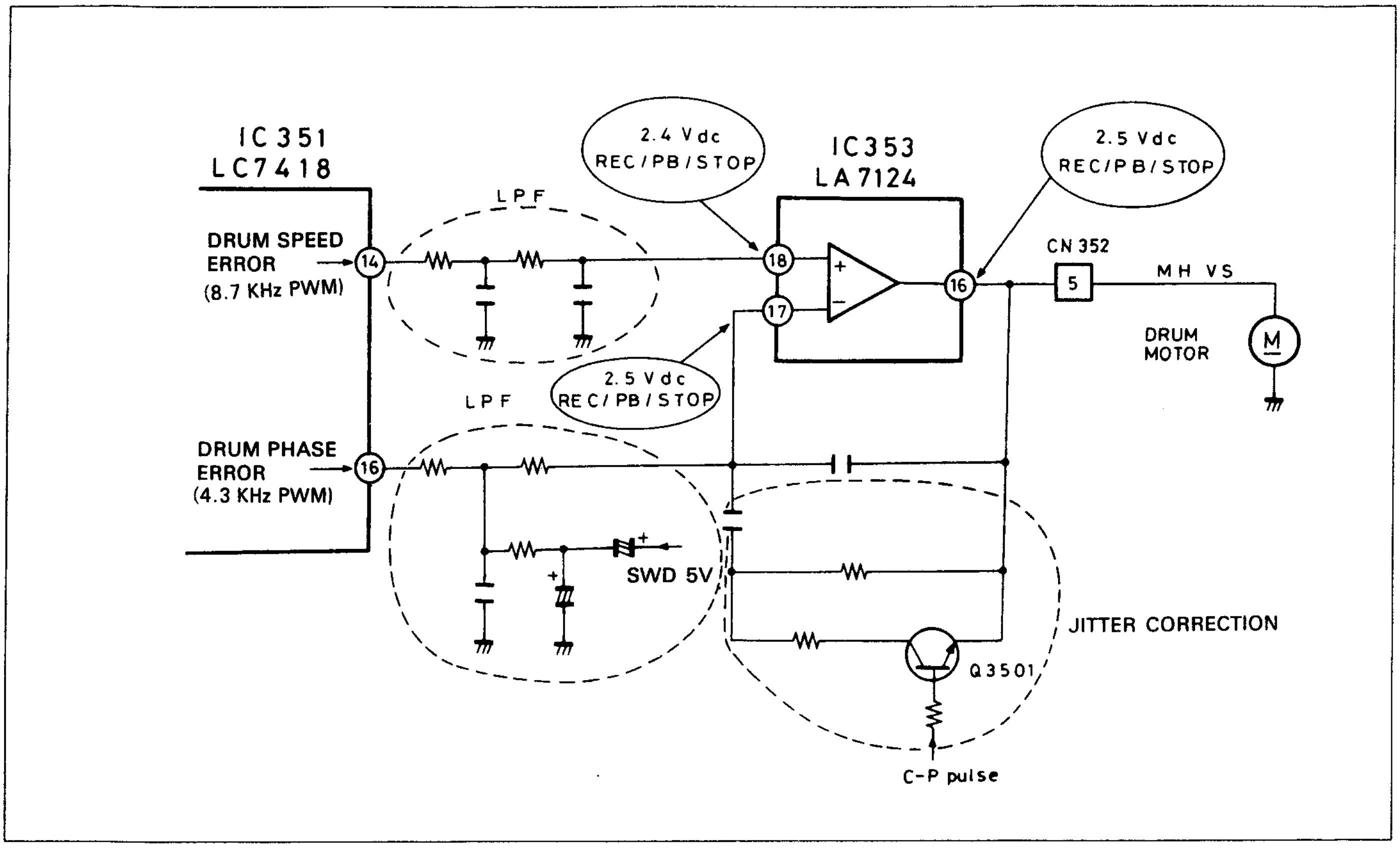

IC351
LC7418
DRUM SPEED ERROR
14
(8.7 KHz PWM)
LPF
2.4 Vdc REC/PB/STOP
IC353
LA7124
18
17
16
2.5 Vdc REC/PB/STOP
CN 352
5
MH VS
DRUM MOTOR
M
2.5 Vdc REC/PB/STOP
LPF
DRUM PHASE ERROR
16
(4.3 KHz PWM)
SWD 5V
JITTER CORRECTION
Q3501
C-P pulse

Fig. 5−13

(2)−6. Drum fH correction

If the drum rotation speed in special PLAYBACK mode (CUE, REVIEW, STILL) is same as the speed in normal PLAYBACK, the relative speed of video head and tape changes. Therefore, to prevent this, the drum speed in special PLAYBACK is changed not to change the frequency of playback horizontal synchronizing signal.

The drum speed varies by changing the reference data of drum speed error detecting circuit (see 3−3). Change of speed in each mode is as follows :

	Change of speed (%)
Mode	SP
STILL	− 0.48
CUE (3H × 5)	+ 1.9
REVIEW (3H × 5)	− 2.88

− : slow in speed
+ : fast in speed

Table 5−4. Change of speed (%) in each mode

6.9 kHz PWM signal of drum phase error output (IC 351 16-pin) is fixed to duty factor 50 %. (Drum phase servo does not operate.)

(3) Capstan servo

〔Capstan speed error〕

Speed error is detected by measuring the period of FG25 signal divided from capstan FG signal input to 23-pin, and PWM signal is output to 20-pin.

〔Capstan phase error〕

REC ······ FG25 signal and CAP REF 25 signal are compared in phase.

PB ······ PB CTL signal and PB TRACK signal delayed from REF 25 signal are compared in phase.

EDIT ··· PB CTL signal and REF 25 signal are compared in phase. Phase error is output to 21-pin in PWM signal.

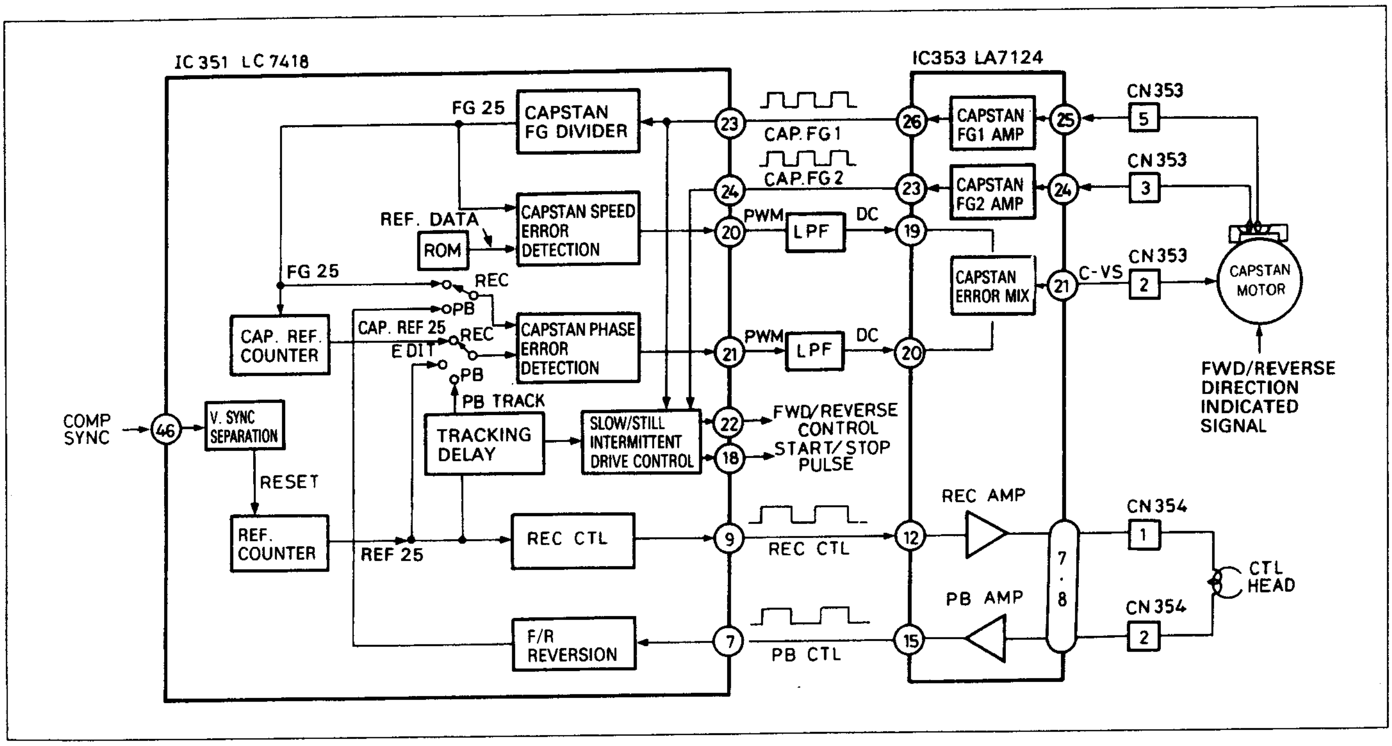

IC351 LC7418
IC353 LA7124
FG 25
CAPSTAN FG DIVIDER
CAP.FG1
CAP.FG2
CAPSTAN FG1 AMP
CAPSTAN FG2 AMP
CN353
5
3
2
REF. DATA
ROM
CAPSTAN SPEED ERROR DETECTION
PWM
LPF
DC
FG 25
REC
PB
CAP. REF COUNTER
CAP. REF 25
EDIT
CAPSTAN PHASE ERROR DETECTION
CAPSTAN ERROR MIX
C-VS
CAPSTAN MOTOR
FWD/REVERSE DIRECTION INDICATED SIGNAL
PB TRACK
COMP SYNC
V. SYNC SEPARATION
TRACKING DELAY
SLOW/STILL INTERMITTENT DRIVE CONTROL
FWD/REVERSE CONTROL
START/STOP PULSE
RESET
REF. COUNTER
REF 25
REC CTL
REC AMP
PB AMP
CN354
1
2
CTL HEAD
F/R REVERSION
PB CTL
23
24
20
21
22
18
9
7
46
26
25
19
12
15
7
8

Fig. 5-14

(3)-1. Capstan FG AMP

CAP FG signal (3H mode : 1513 Hz) generated by the rotation of capstan motor is shaped into square wave. CAP.FG2 is also amplified in the same way as CAP-FG1. CAP-FG2 is input from CN353 3-pin to IC353 24-pin. CAP-FG2 is used for the control in SLOW-MOTION.

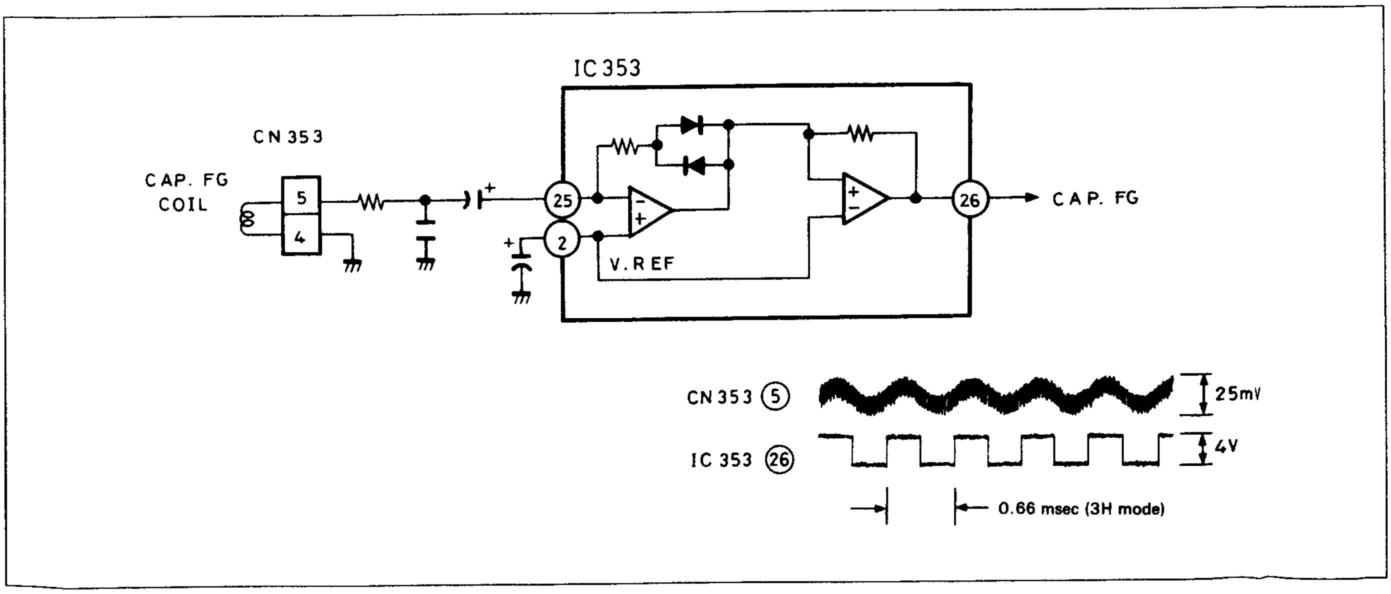
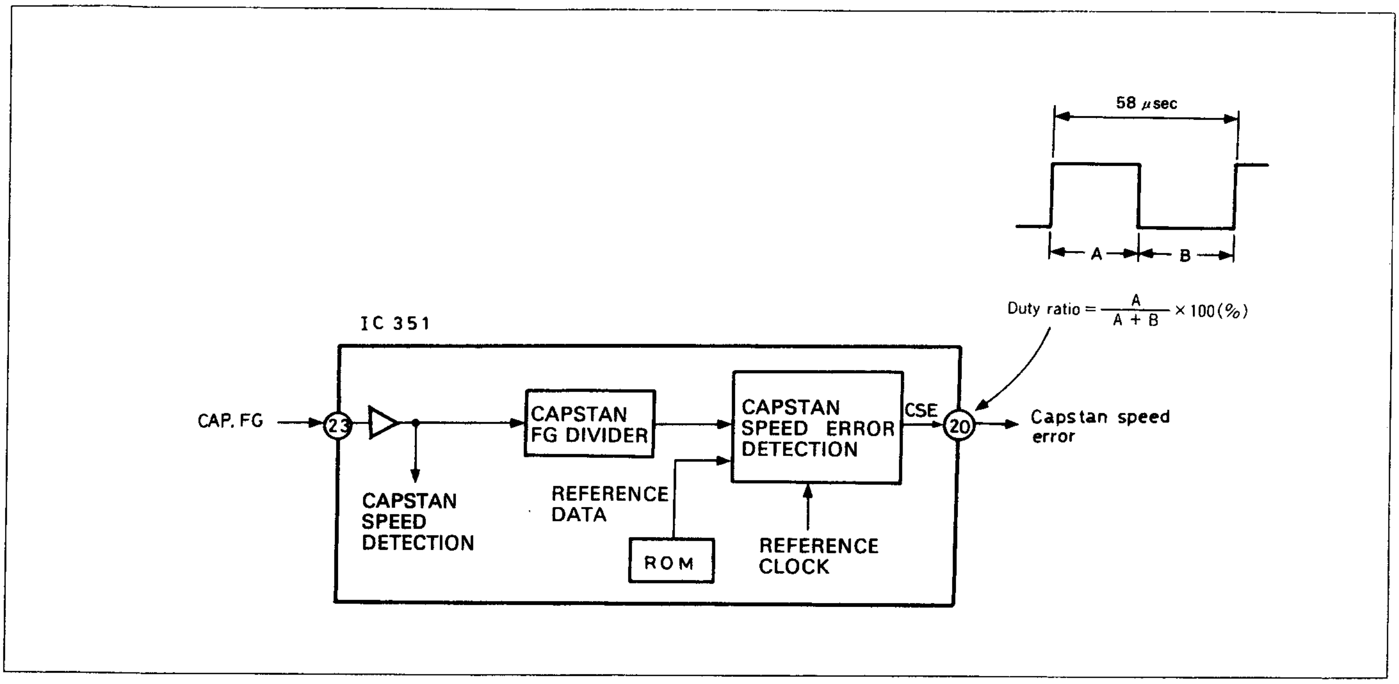

IC353
CN353
CAP. FG COIL
5
4
25
2
26
V.REF
CAP. FG
CN353 ⑤
25mV
IC353 ㉖
4V
0.66 msec (3H mode)

Fig. 5-15

(3)−2. Detection of capstan speed error

The cycle of the divided CAP.FG signal is measured.



58 μsec
A
B
Duty ratio = A / (A + B) × 100(%)
IC 351
CAP. FG
23
CAPSTAN FG DIVIDER
CAPSTAN SPEED ERROR DETECTION
CSE
20
Capstan speed error
CAPSTAN SPEED DETECTION
REFERENCE DATA
ROM
REFERENCE CLOCK

Fig. 5−16

Capstan speed error is output from 20-pin in PWM signal.

Mode / Tape speed	REC/PB	SEARCH
3H	17.3K	17.3K

Table. 5−5

The duty of PWM signal changes according to tape speed as follows :

Capstan rotation speed	Capstan FG cycle	PWM signal duty
fast	to and less	50 % and less
normal *1	to	50 %
slow	to and more	50 % and more

*1 : to-value in normal PLAYBACK is as follows :
3H mode ··· 0.66 msec (1513 Hz),

Table. 5−6

(3)−3. Detection of capstan phase error

REC, PB, and EDIT modes are different in detecting way of phase error.

Operation mode	Reference signal	Comparison signal
PLAYBACK (including special playback)	Signal obtained by delaying REF 25 signal (drum phase servo reference signal) in tracking delay circuit (PB TRACK signal)	PB CTL signal
RECORD	C-REF 25 signal	FG 25 signal
EDIT	REF 25 signal	PB CTL signal

Tble. 5−7

〔In RECORD〕

Capstan phase error signal is generated by phase-comparing C-REF 25 signal with FG25 signal divided from FG signal.

(1) FG25 frequency demultiplier

Mode	3H
Capstan FG frequency (Hz)	1513
Divided ratio	1/60
FG25 frequency (Hz)	25.22

Table. 5−8

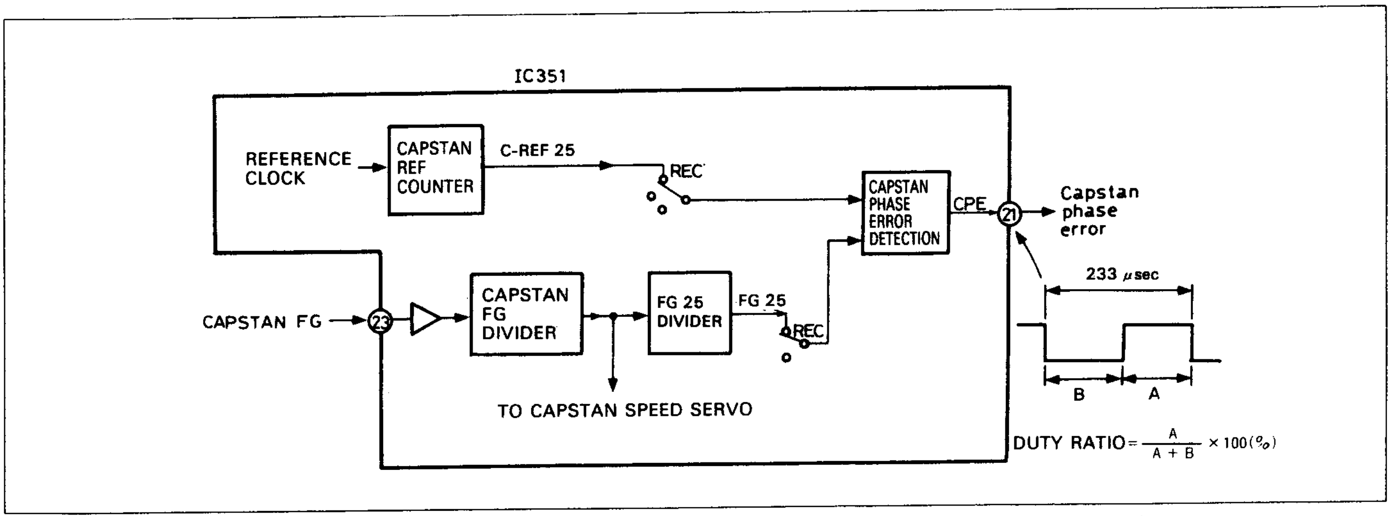

IC351
REFERENCE CLOCK
CAPSTAN REF COUNTER
C-REF 25
REC
CAPSTAN PHASE ERROR DETECTION
CPE
21
Capstan phase error
233 μsec
B
A
DUTY RATIO = A / (A + B) × 100(%)
CAPSTAN FG
23
CAPSTAN FG DIVIDER
FG 25 DIVIDER
FG 25
REC
TO CAPSTAN SPEED SERVO

Fig. 5−17

(2) Capstan phase error output

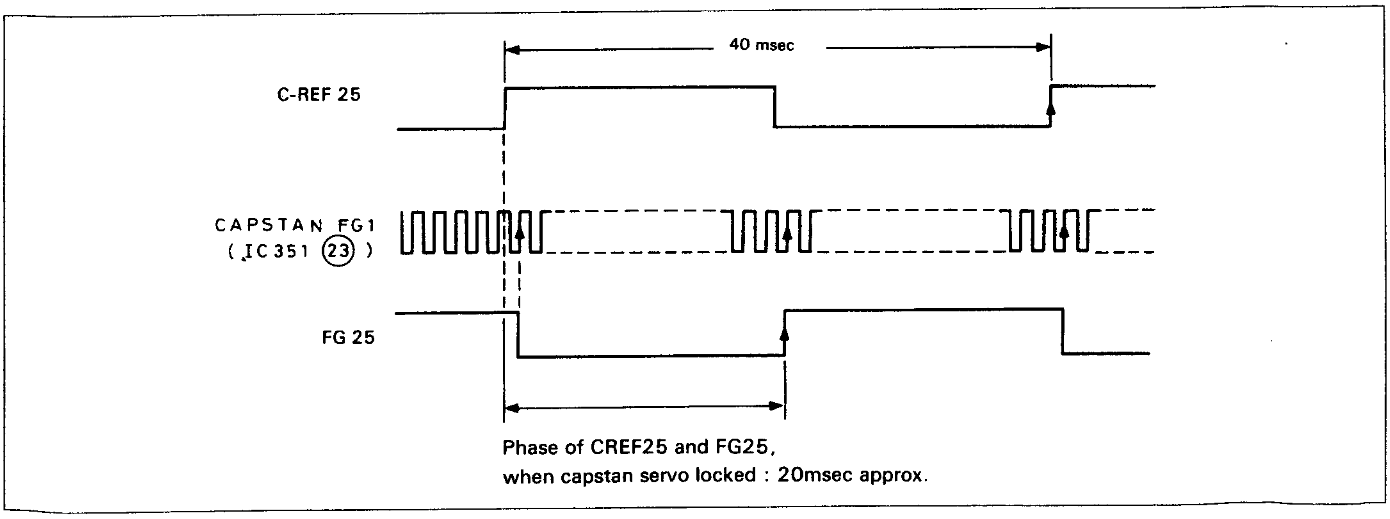
Capstan phase error is output from 21-pin in 4.3 kHz PWM signal.

The duty of PWM signal changes acoording to phase difference as follows :

(3) Timing chart

Phase difference between C-REF 25 signal and FG25 signal	Duty of PWM signal
Smaller than normal	50 % and more
Normal (when locked)	50 %
Larger than normal	50 % and less

Table. 5−9


40 msec
C-REF 25
CAPSTAN FG1
(IC351 ㉓)
FG 25

Phase of CREF25 and FG25, when capstan servo locked : 20msec approx.

Fig. 5−18

〔In PLAYBACK〕
Capstan phase error signal is generated by phase-comparing PB TRACK signal obtained by delaying REF 25 signal with PB CTL signal.

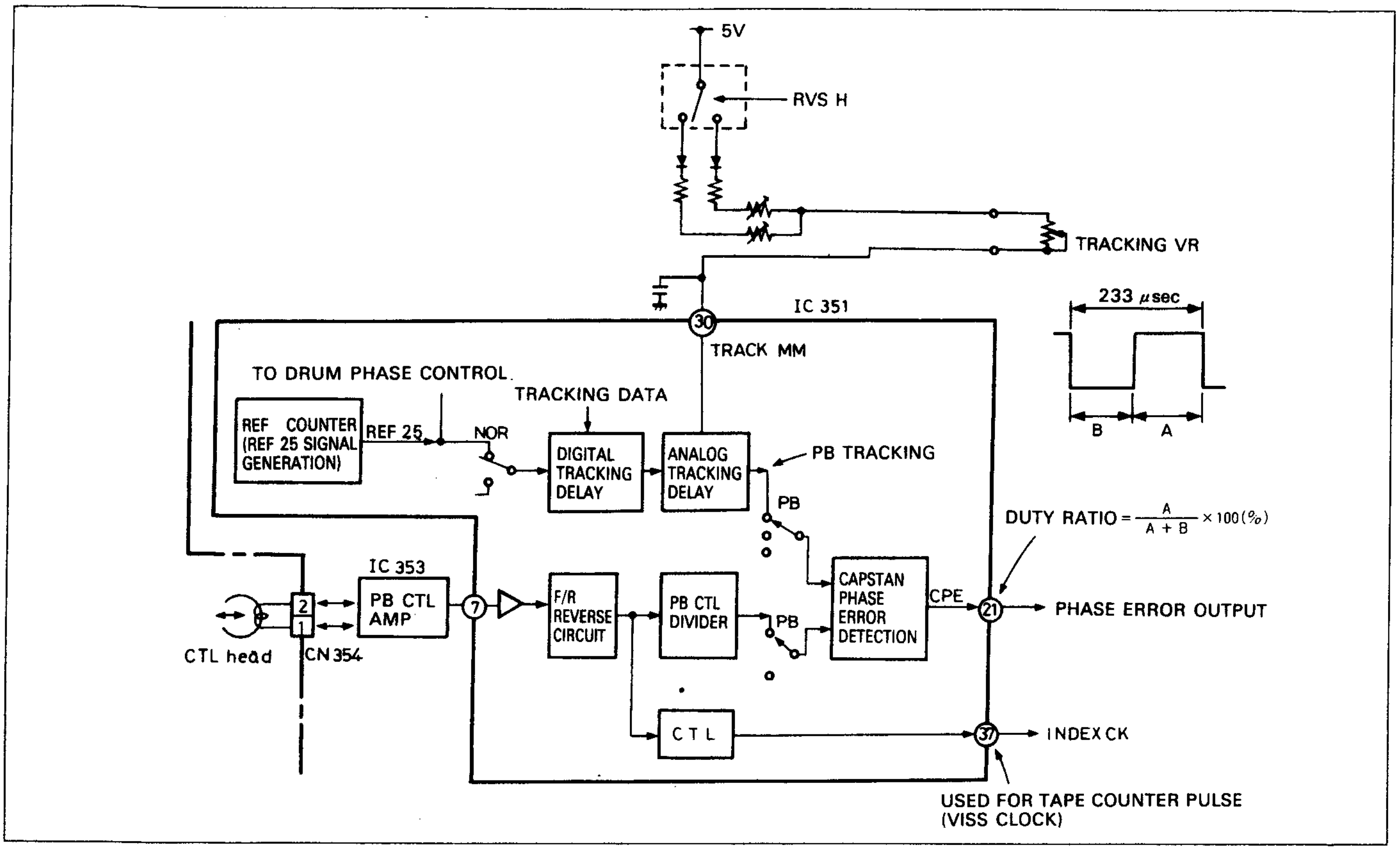

5V
RVS H
TRACKING VR
IC 351
30
TRACK MM
233 μsec
B
A
TO DRUM PHASE CONTROL.
TRACKING DATA
REF COUNTER (REF 25 SIGNAL GENERATION)
REF 25
NOR
DIGITAL TRACKING DELAY
ANALOG TRACKING DELAY
PB TRACKING
PB
DUTY RATIO = A/(A + B) × 100(%)
IC 353
PB CTL AMP
7
F/R REVERSE CIRCUIT
PB CTL DIVIDER
PB
CAPSTAN PHASE ERROR DETECTION
CPE
21
PHASE ERROR OUTPUT
2
1
CTL head
CN354
CTL
37
INDEX CK
USED FOR TAPE COUNTER PULSE (VISS CLOCK)

Fig. 5-19

(1) Tracking delay circuit
Delay volume is variable by users for tracking adjustment.
IC351 (LC7418) has digital delay circuit and analog delay circuit.
For this Model ; the delay volume of digital delay circuit is fixed in each mode, and it is in analog circuit only that the delay volume is variable.

	Delay volume
variable range	0 ± 9 msec
Tracking center	20msec approx.

Table. 5−10

(2) FWD/REVERSE inverting circuit
The polarity of PB CTL signal, comparison signal of capstan phase servo, in foward direction is reversed with in reverse direction. Therefore, it is inverted in the reverse direction. (In forward direction, the rising (⎍) of PB CTL signal is used for detecting phase error.)

(3) PB CTL frequency demultiplier
To operate capstan phase servo in special playback and to fix the noise bar position on the screen, PB CTL signal is divided as follows :

PB	Picture search
	2H 5 time
1	1/5

Table. 5−11. Division ratio

(4) Capstan phase error output
Capstan phase error is output from 24-pin in 13.8 kHz PWM signal. The duty of PWM signal changes according to phase difference as follows :

PB CTL signal for reference phase(⎍) phase	PWM signal duty factor
Fast	50 % and more
Equal	50 %
Slow	50 % and less

Table. 5−12

(5) Timing chart

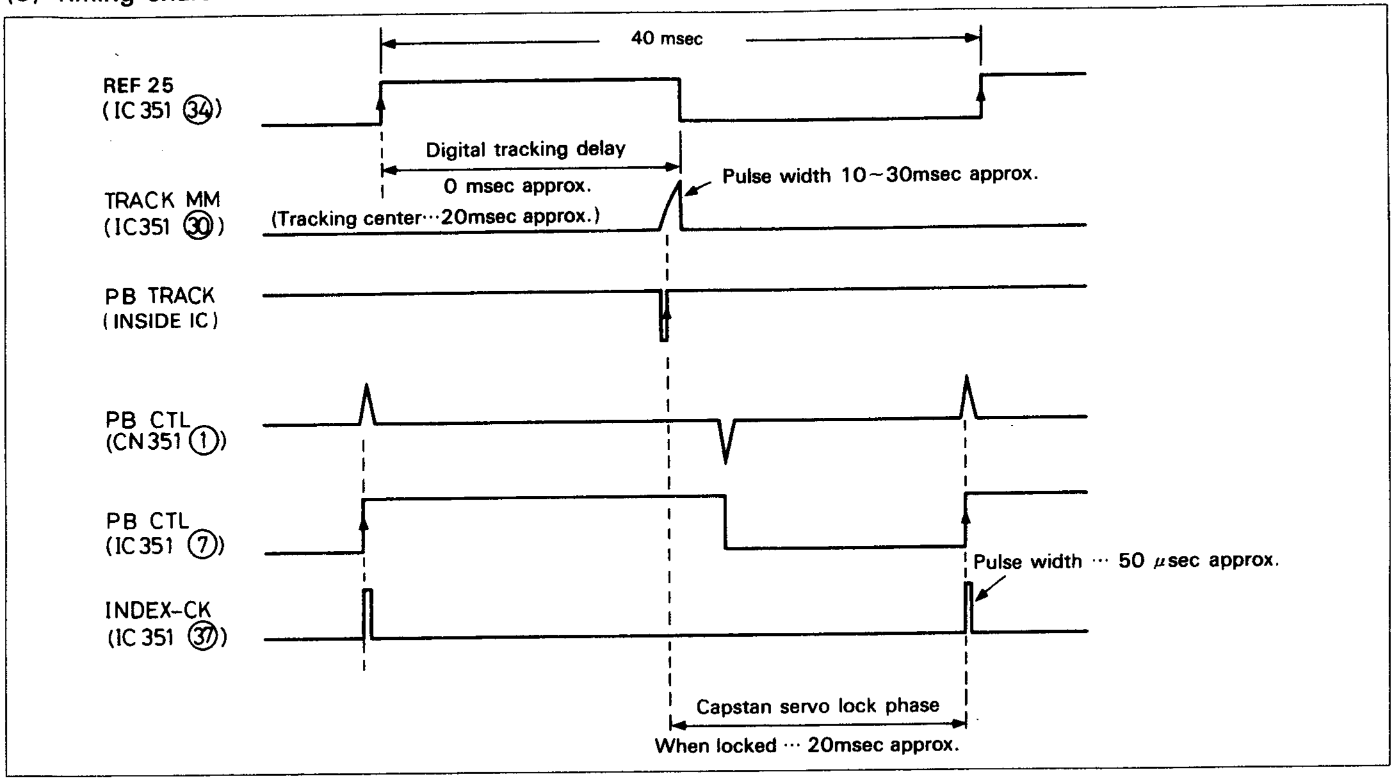


Fig. 5-20

〔In EDIT〕

capstan phase error signal is generated by phase-comparing of REF 25 signal and PB CTL signal. REF 25 signal is synchronizing with V.SYNC signal synchronously separated from input video signal as in REC. Therefore ; drum motor rotates in synchronous with input video signal, and capstan moves the tape so that the video head may trace on the recorded track of the tape.

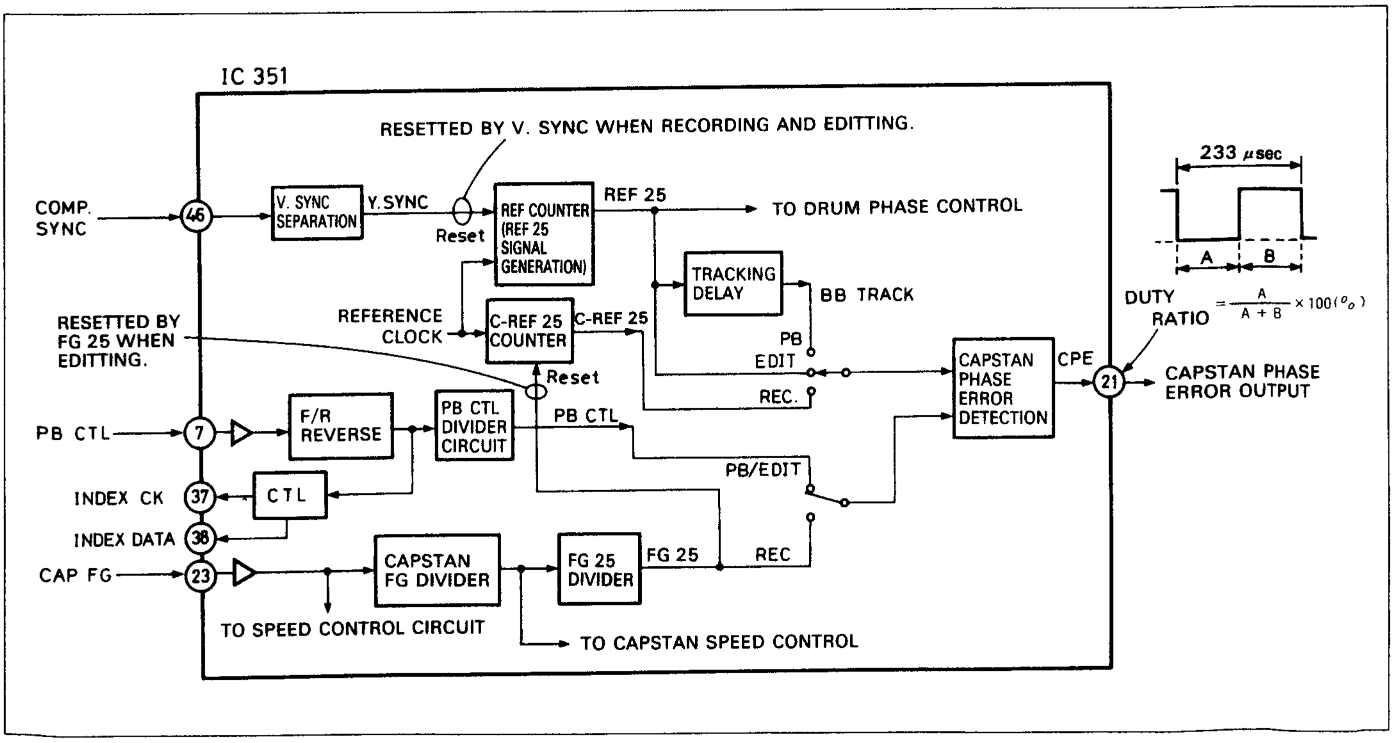

IC 351
RESETTED BY V. SYNC WHEN RECORDING AND EDITTING.
COMP. SYNC
㊻
V. SYNC SEPARATION
Y. SYNC
Reset
REF COUNTER (REF 25 SIGNAL GENERATION)
REF 25
TO DRUM PHASE CONTROL
TRACKING DELAY
BB TRACK
REFERENCE CLOCK
C-REF 25 COUNTER
C-REF 25
RESETTED BY FG 25 WHEN EDITTING.
Reset
PB
EDIT
REC.
CAPSTAN PHASE ERROR DETECTION
CPE
㉑
CAPSTAN PHASE ERROR OUTPUT
233 μsec
A
B
DUTY RATIO = A/(A + B) × 100(%)
PB CTL
⑦
F/R REVERSE
PB CTL DIVIDER CIRCUIT
PB CTL
PB/EDIT
INDEX CK
㊲
CTL
INDEX DATA
㊳
CAP FG
㉓
CAPSTAN FG DIVIDER
FG 25 DIVIDER
FG 25
REC
TO SPEED CONTROL CIRCUIT
TO CAPSTAN SPEED CONTROL

Fig. 5-21

(1) REF counter (REF 25 signal generating circuit)
REF 25 signal is reseted by V.SYNC signal separated from input video signal as in REC, and synchronizes with input video signal.
Therefore, drum rotation phase synchronizes with input video signal.

(2) F/R inverting circuit
When the mode is changed to REC → REC PAUSE, the tape moves a little to REVERSE direction, and during this period PB CTL signal is inverted.

(3) Capstan phase error output
Capstan phase error is output from 21-pin in 13.8 kHz PWM signal. When the time lag between REF 25 signal rising (↑) and PB CTL signal rising (↑) is 20msec, 13.8 kHz PWM signal with duty 50 % is output.

(4) Timing chart

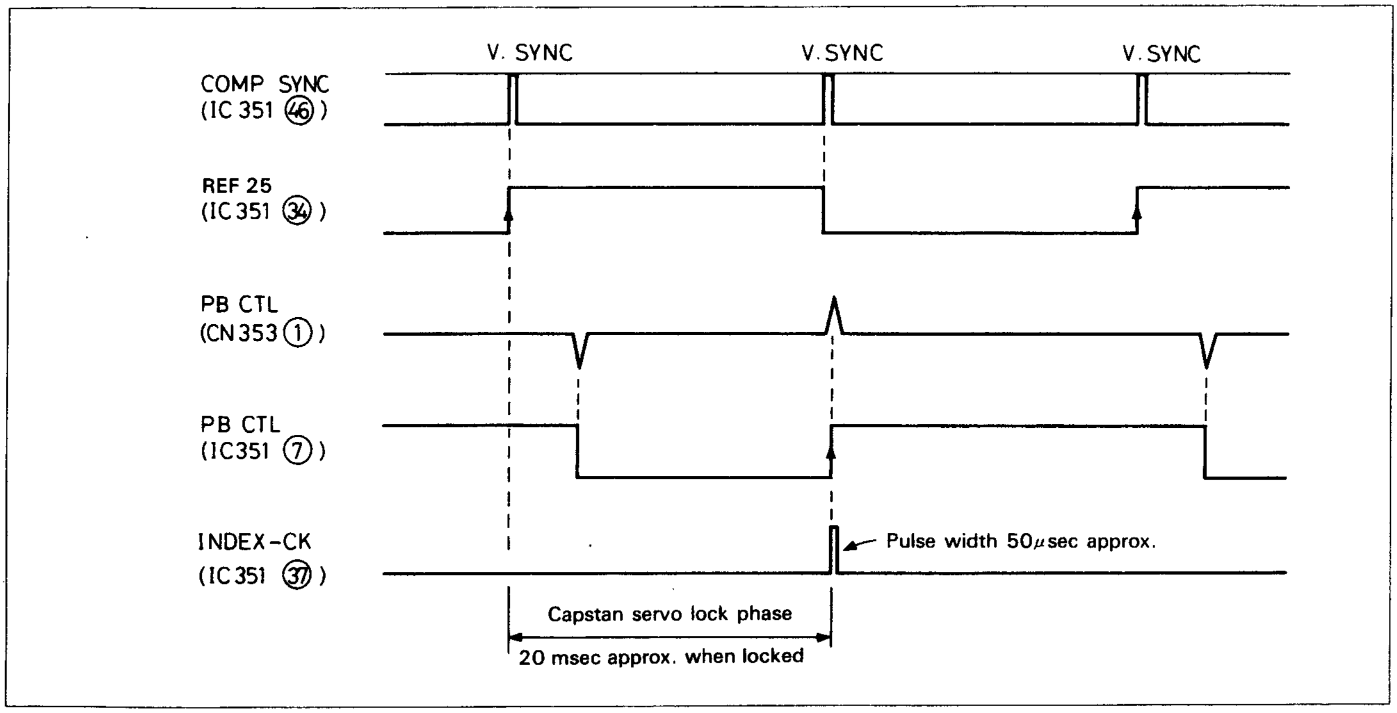
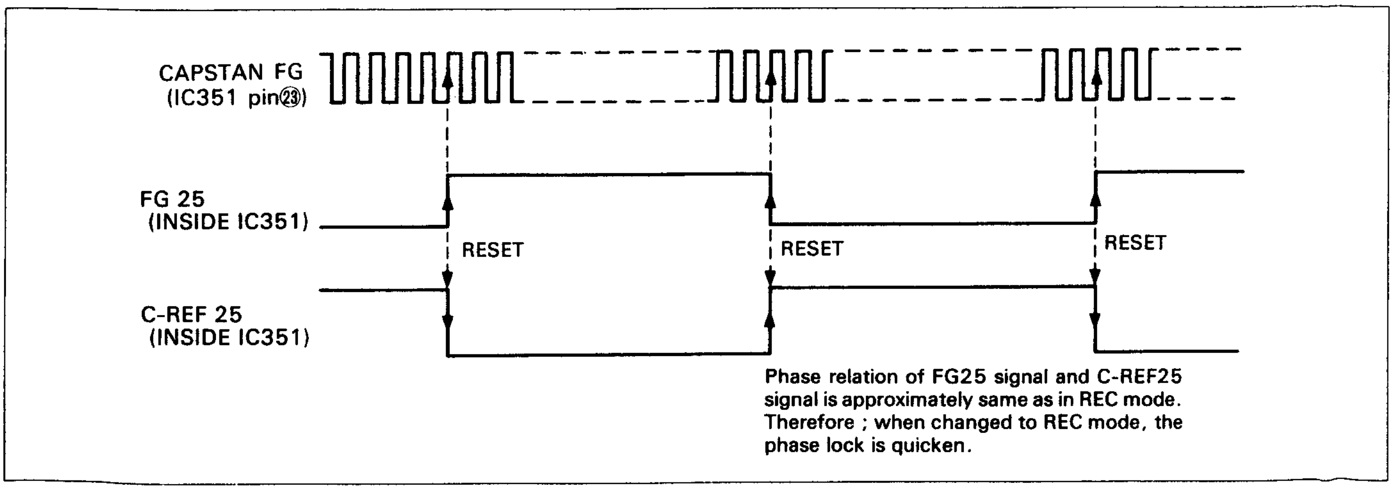

V. SYNC
V. SYNC
V. SYNC
COMP SYNC
(IC 351 ㊻)
REF 25
(IC351 ㉞)
PB CTL
(CN353 ①)
PB CTL
(IC351 ⑦)
INDEX-CK
(IC351 ㊲)
Pulse width 50μsec approx.
Capstan servo lock phase
20 msec approx. when locked

Fig. 5-22

(5) REC PAUSE → REC
When capstan phase servo is changed from EDIT mode to REC mode, capstan reference counter is reset in FG25 signal in the period of EDIT mode phase servo to quicken the phase lock of capstan phase servo, and C-REF 25 (reference signal) is syncronized with FG25 signal (comparison signal).


CAPSTAN FG
(IC351 pin㉓)
FG 25
(INSIDE IC351)
RESET
RESET
RESET
C-REF 25
(INSIDE IC351)

Phase relation of FG25 signal and C-REF25 signal is approximately same as in REC mode. Therefore ; when changed to REC mode, the phase lock is quicken.

Fig. 5-23

(3)-4. LPF and capstan servo error mix AMP

(1) LPF

Capstan error signal is output in PWM signal, and is changed to DC error signal by LPF.

(2) Error mix AMP

Capstan speed error signal smoothed by LPF and capstan phase error signal are mixed to generate capstan motor control signal (CAP Vs).

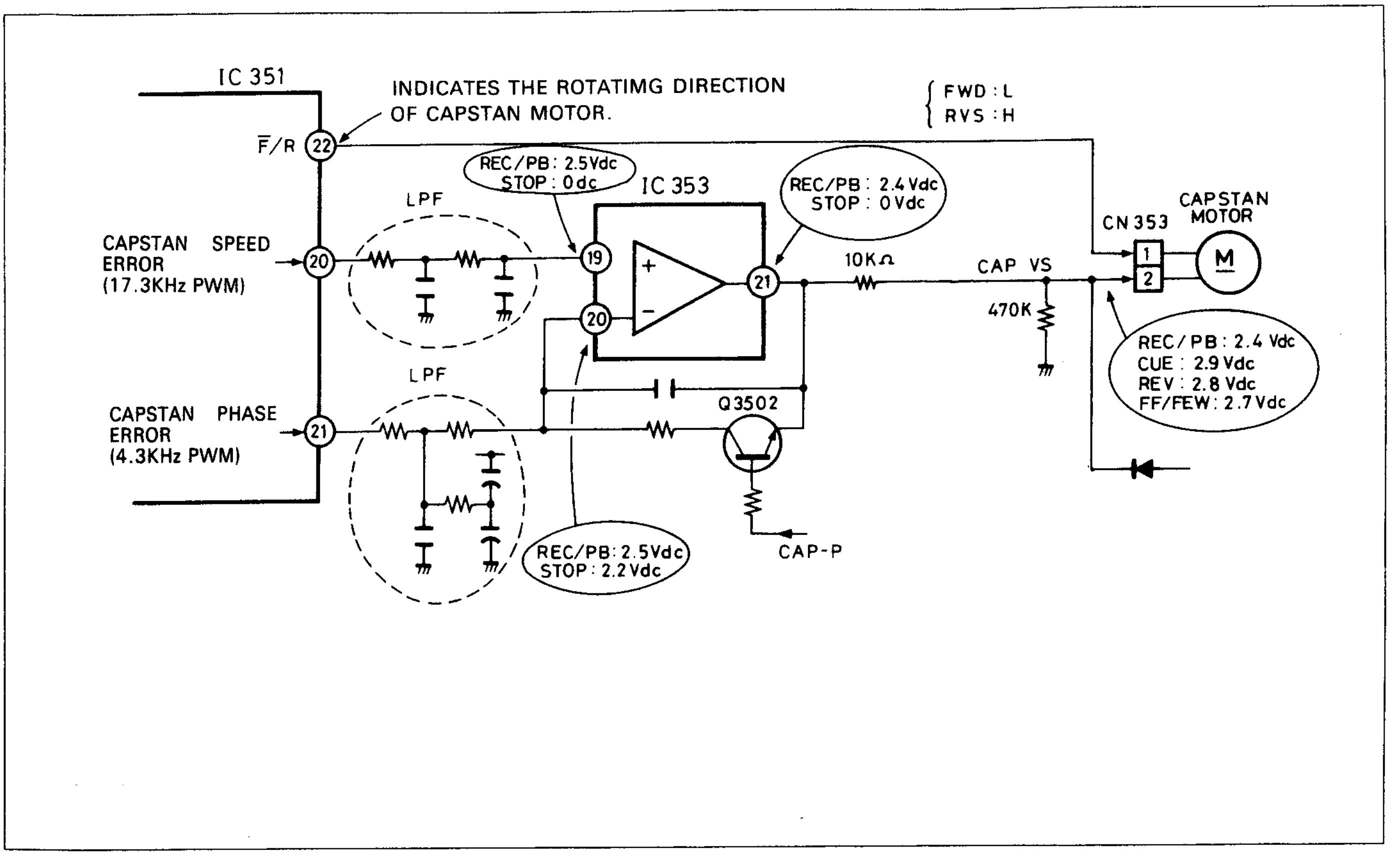

IC 351
INDICATES THE ROTATIMG DIRECTION OF CAPSTAN MOTOR.
FWD : L
RVS : H
F̄/R
22
REC/PB : 2.5Vdc
STOP : 0dc
IC 353
REC/PB : 2.4Vdc
STOP : 0Vdc
LPF
CAPSTAN SPEED ERROR (17.3KHz PWM)
20
19
+
−
20
21
10KΩ
CAP VS
CN353
CAPSTAN MOTOR
1
2
M
470K
REC/PB : 2.4 Vdc
CUE : 2.9 Vdc
REV : 2.8 Vdc
FF/FEW : 2.7 Vdc
LPF
CAPSTAN PHASE ERROR (4.3KHz PWM)
21
Q3502
REC/PB : 2.5Vdc
STOP : 2.2Vdc
CAP-P

Fig. 5-24

- Q3502 is turned ON by CAP-P (the signal which is ON when slow intermittent drived), and capstan error mix AMP gain is dropped to reduce capstan servo hunting.

(3)−5. CTL signal

This is the signal to record in control track to use as capstan phase servo comparison signal in PLAYBACK. In this model the signal with the timing for tape from the IC351 REC CTL output is generated in the system control microcomputer, which signal inputs to the IC353 No.12 pin.

〔In REC〕

REC CTL signal which is the reference siganl for drum phase servo is generated from REF 25 (RET-TRK) signal.

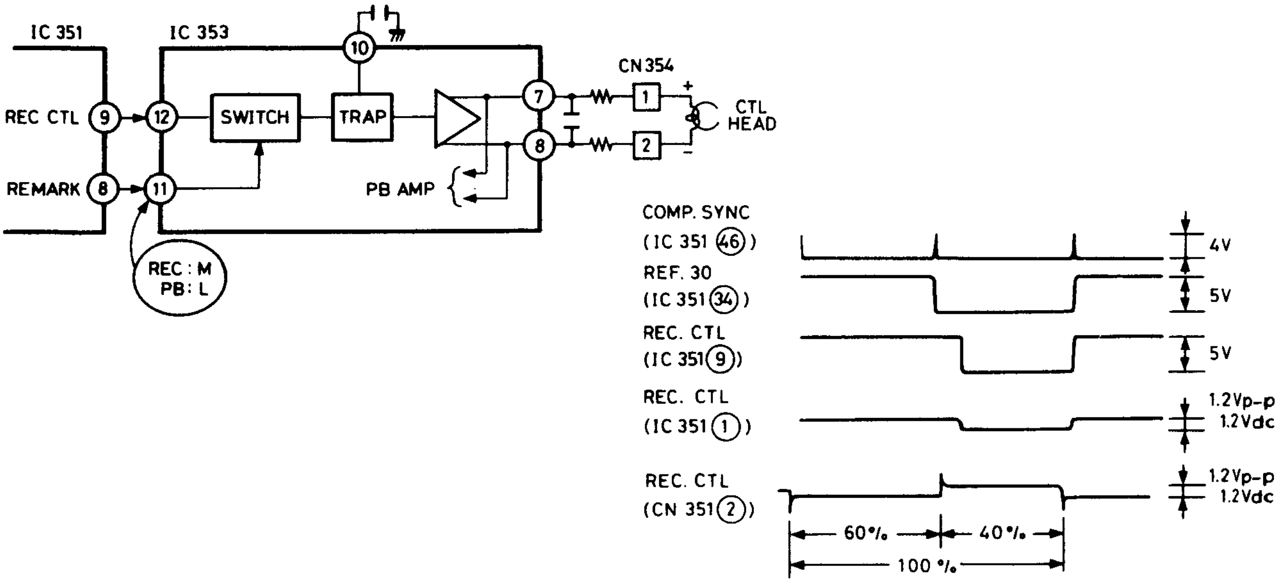
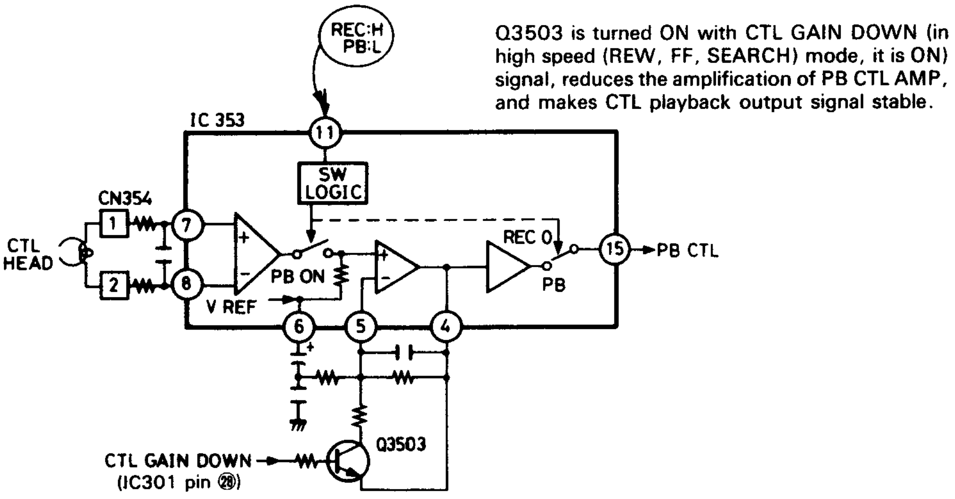

IC 351
IC 353
10
CN354
REC CTL ⑨
⑫
SWITCH
TRAP
⑦
⑧
1
2
+
−
CTL HEAD
REMARK ⑧
⑪
PB AMP
REC : M PB : L
COMP. SYNC (IC 351 ㊻)
REF. 30 (IC 351 ㉞)
REC. CTL (IC 351⑨)
REC. CTL (IC 351①)
REC. CTL (CN 351②)
4V
5V
5V
1.2Vp-p 1.2Vdc
1.2Vp-p 1.2Vdc
60%
40%
100%

Fig. 5−25

〔In PB〕

CTL signal played back in CTL head is shaped into square wave.


REC:H PB:L
IC 353
⑪
SW LOGIC
CN354
1
2
⑦
⑧
CTL HEAD
+
−
PB ON
V REF
⑥
⑤
④
REC O
PB
⑮
PB CTL
Q3503
CTL GAIN DOWN (IC301 pin ㉘)

Q3503 is turned ON with CTL GAIN DOWN (in high speed (REW, FF, SEARCH) mode, it is ON) signal, reduces the amplification of PB CTL AMP, and makes CTL playback output signal stable.

Fig. 5−26

(4) Quasi VD signal

Quasi VD signal is added to playback video signal so that the picture vertical synchronization may be stable in special PLAYBACK. This quasi VD signal is generated from SW25 signal. Quasi VD signal is output at the value of 3.

48-pin output level	Video signal
H	Cramp to sink chip level.
M	Cramp to pedestal level.
H	Playback signal is output as it is.

Table. 5–13

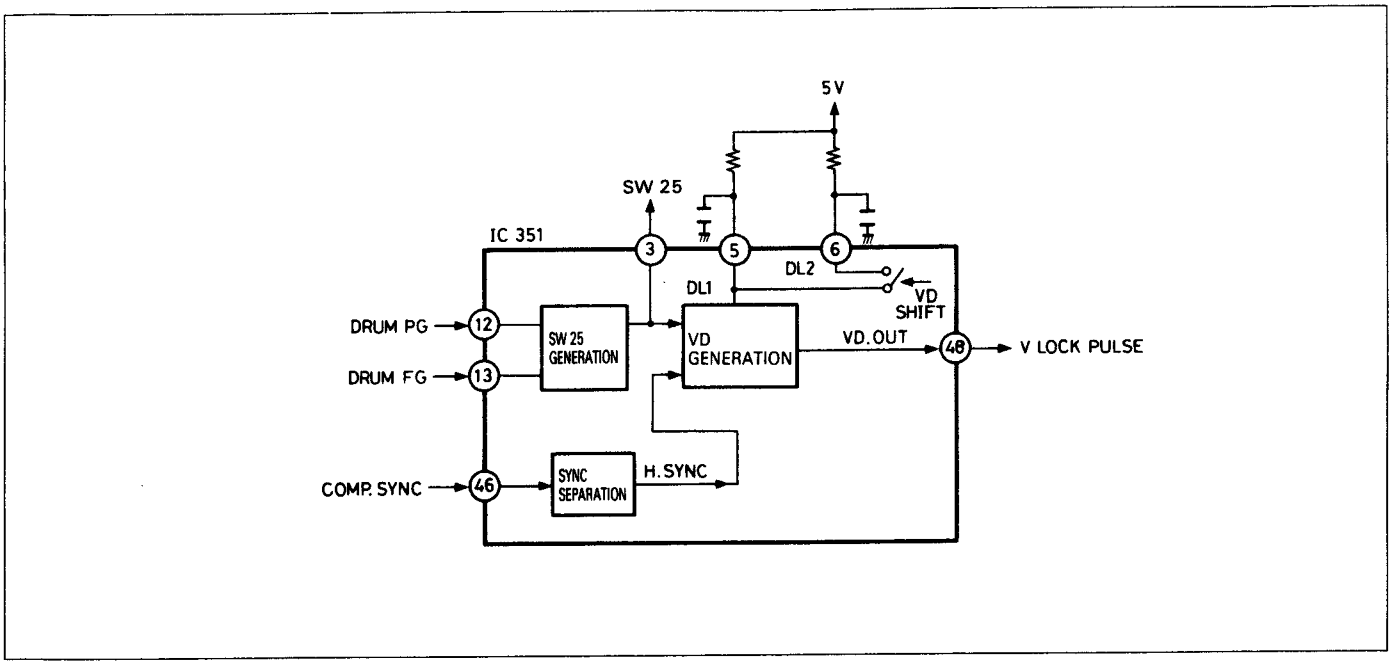

5V
SW 25
IC 351
3
5
6
DL1
DL2
VD SHIFT
DRUM PG
DRUM FG
COMP. SYNC
12
13
46
SW 25 GENERATION
VD GENERATION
VD.OUT
48
V LOCK PULSE
SYNC SEPARATION
H.SYNC

Fig. 5–28

5-3-2. Gate array IC (IC352)

The following describes the major internal function. (Fig. 5-29)

(1) Head change signal generating circuit
For 1-field intermittent slow, the head change signal which is different from the one used for frame slow is required. In order to cope with this necessity, this IC generates rotary signal by using the signal of both rise and fall edge slices of RF SW P as clock and inverting the output of the inverted signal of F ADV P with the edge of the second RF SW P after the rising of F ADV P by the Reset D-FF and dividing this output by 2. H AMP SW signal is produced from EX-OR of this rotary and RF SW P. By switching the polarity of the above ROTARY and H AMP SW according to the tape speed, playback picture with less noise can be obtained.
Furthermore, when moving from PB to STILL, as PB is still continued even when SL + ST has risen, if the above signal is output by synchronizing it with SL + ST, noise is caused to the screen.
Therefore, the signal of this IC is not output until the rise of the first FADV P in $\overline{SP}$ mode and until the 3rd F ADV P falls down in SP mode. Instead, the signal of the main servo IC (LC7418) shall be output until the above timing.
Similarly when moving from STILL to PB, as STILL condition is continued until START-P is issued even after SL + ST has fallen down, the signal of this IC shall be output until RFSW P falls down after SL + ST has risen.

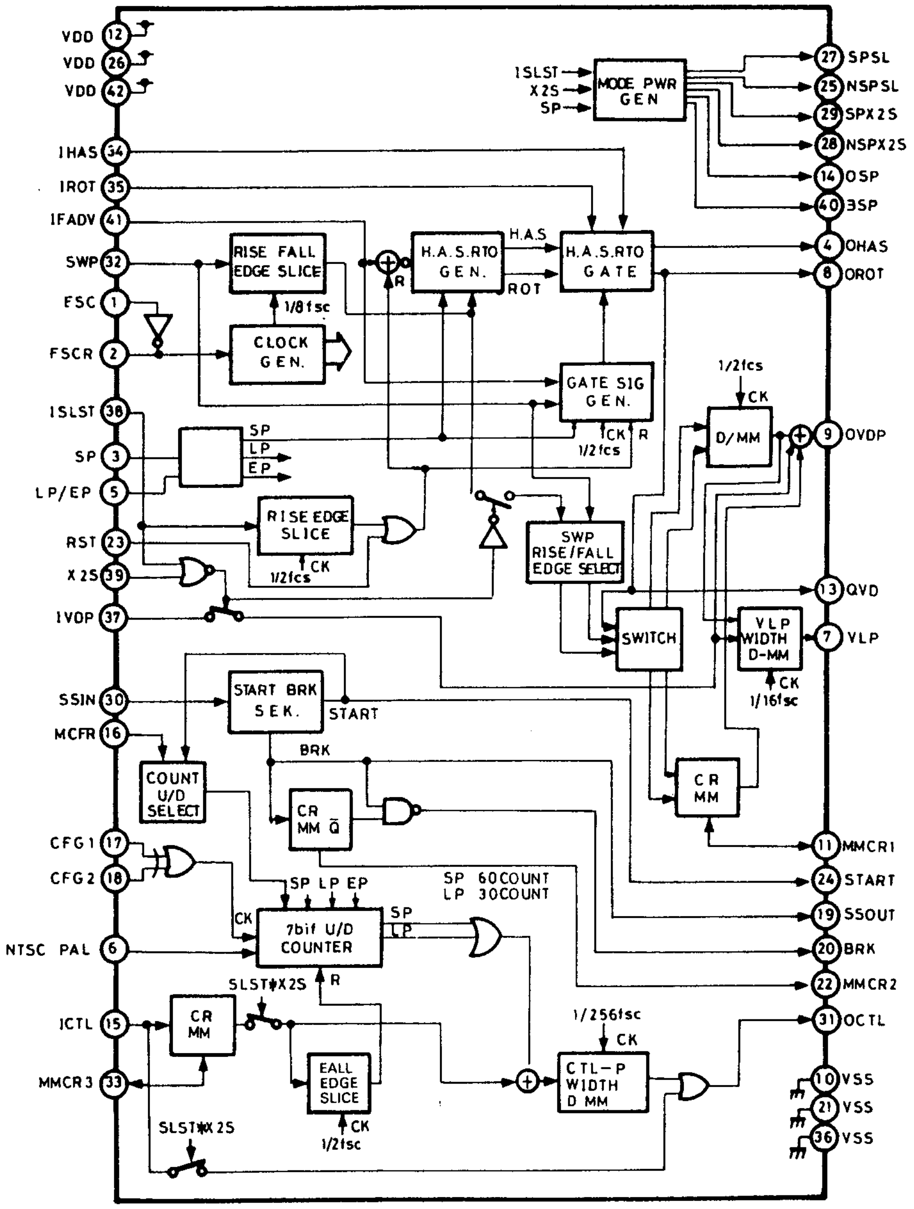

VDD 12
VDD 26
VDD 42
IHAS 34
IROT 35
IFADV 41
SWP 32
FSC 1
FSCR 2
ISLST 38
SP 3
LP/EP 5
RST 23
X2S 39
IVOP 37
SSIN 30
MCFR 16
CFG1 17
CFG2 18
NTSC PAL 6
ICTL 15
MMCR3 33
ISLST
X2S
SP
MODE PWR GEN
27 SPSL
25 NSPSL
29 SPX2S
28 NSPX2S
14 OSP
40 3SP
RISE FALL EDGE SLICE
1/8fsc
CLOCK GEN.
R
H.A.S.RTO GEN.
H.A.S
ROT
H.A.S.RTO GATE
4 OHAS
8 OROT
GATE SIG GEN.
CK R
1/2fcs
1/2fcs
CK
D/MM
9 OVDP
SP
LP
EP
RISE EDGE SLICE
CK
1/2fcs
SWP RISE/FALL EDGE SELECT
13 QVD
SWITCH
VLP WIDTH D-MM
7 VLP
CK
1/16fsc
START BRK SEK.
START
BRK
COUNT U/D SELECT
CR MM Q̄
CR MM
11 MMCR1
24 START
19 SSOUT
20 BRK
22 MMCR2
31 OCTL
SP LP EP
SP 60COUNT
LP 30COUNT
CK
7bit U/D COUNTER
SP
LP
SLST✱X2S
R
CR MM
EALL EDGE SLICE
CK
1/2fsc
SLST✱X2S
1/256fsc
CK
CTL-P WIDTH D MM
10 VSS
21 VSS
36 VSS

Fig. 5-29. Block diagram of IC352 gate array

(2) Quasi CTL P generating circuit

Intermittent slow performs a series of operation with the start pulse synchronous with F ADV P and the brake pulse synchronous with CTL P. However, as CTL P is recorded (one every 25 Hz) in synchronization with vertical synchronizing signal, there are fields with CTL P output and those without CTL P output in case of 1-field intermittent feeding. Here, for the fields without CTL P output, quasi CTL P should be produced to apply brake like the phase relation of the fields with CTL P output. For this purpose, this IC from the viewpoint to make the tape move constant, produces quasi CTL P according to each tape speed by using 7-bit counter with the clock of CFG X 2 signal which is EX-OR of the capstan motor FG pulse (CFG1, CFG2).

(3) Quasi vertical synchronizing signal generating circuit

As the different head is selected for Mc STOP and for drive (STILL and PB) of intermittent slow, gap in vertical position shall be caused on the screen by the gap between the heads or gap in mounting angle (gap of 2H) unless the inserting position of quasi vertical synchronizing signal is changed. Here, this IC produces the signal for shifting the inserting position of quasi vertical synchronizing signal (QVD) so that the width of VDP or inserting position of quasi vertical synchronizing signal is determined by D-MM or CR-MM according to the "HIGH", "LOW" of this signal and polarity of the RFSW P edge.

(4) Mode power supply

It is so designed that each mode power supply is output to SL + ST, X2, SP, $\overline{SP}$ respectively. (SPSL, SP × 2S, NSPSL, NSP × 2S, OSP, BSP)

(5) Others

a) BRK

This is the signal to drop brake pulse for correcting screen swing. The phase can be changed with CR-MM.

b) START

Signal only of START out of S/SIN.

c) SSOUT

Signal only of STOP (BRK)out of S/SIN.

5-3-3. Servo interface IC (IC353)

The following circuits related with analog amplifier in the servo circuit are incorporated in this IC. (Fig. 5-30)

(1) Control voltage mixing amplifier

Op amplifier for mixing speed and phase control voltage. Two amplifiers for drum and capstan are incorporated.

(2) FG amplifier

Amplifier for amplifying and shaping waveform of FG signal for drum and capstan motor respectively. Three amplifiers, one for drum and two for capstan are incorporated.

(3) PG amplifier

Amplifier for amplifying and shaping wavefrom of PG signal for drum phase control. It comprises pre-amplifier and Schmitt amplifier.

(4) CTL amplifier

This amplifier comprises CTL pulse DC recording amplifier, playback amplifier consisting pre-amplifier, AGC amplifier, wave shaping amplifier, and switching circuit for them.

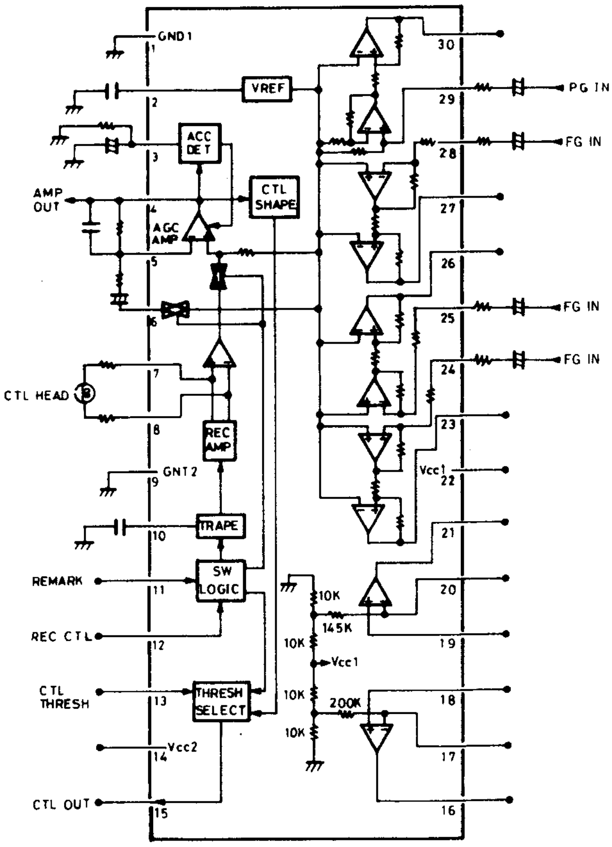


Fig. 5-30. Block diagram of IC353

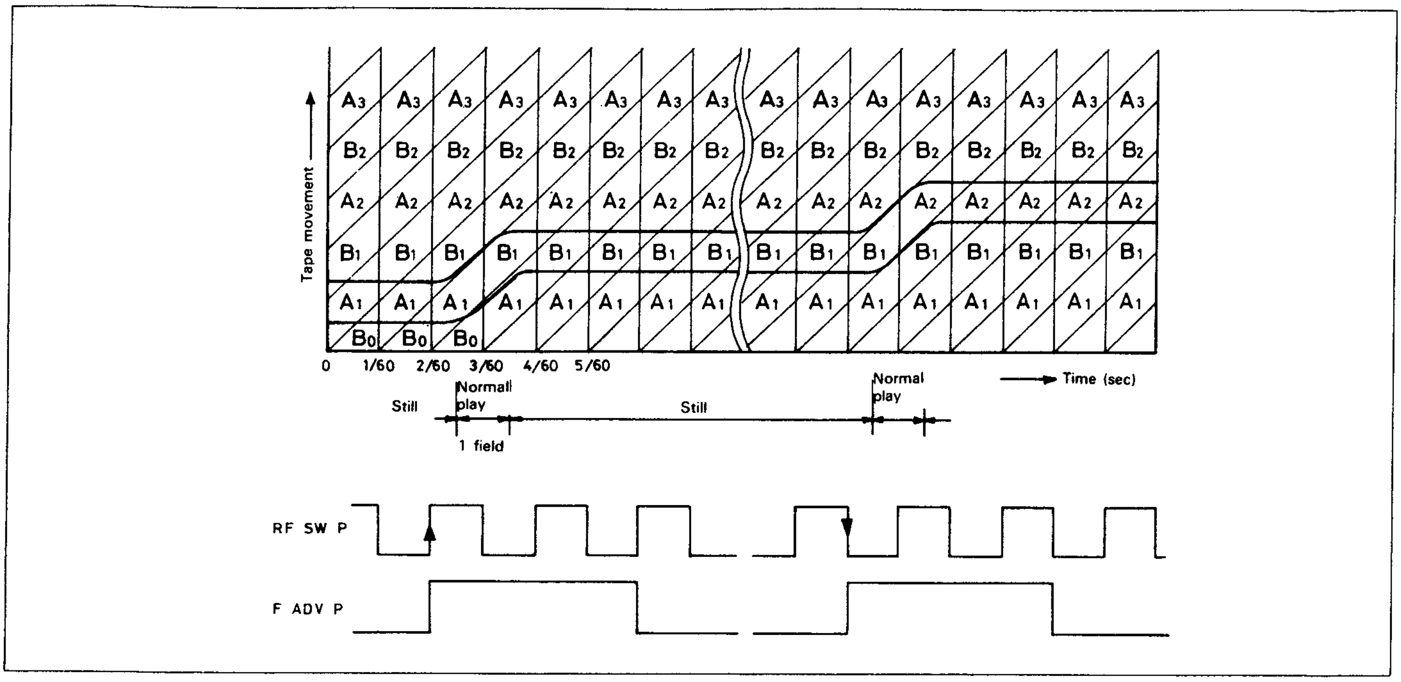


Fig. 5-31

5-3-4. 1-field slow control

Intermittent slow is performed by repeating STILL and PLAY. (See Fig. 5-31.) However, the tape move during the normal play is extremely a little with 1 field (half a cycle of RF switching pulse). When normal play is started from STILL, START pulse is generaed to rise the motor rotation to regular speed, the speed control circuit functions and keeps the regular speed. When the control signal is detected during this normal play, after tracking correction is performed, F/R signal is dropped to LOW as soon as STOP pulse is output and the tape is stopped in the noise free position by stopping the motor on the spot. This operation is repeatedly executed every time F ADV P is input to realize intermittent slow picture, The following describes this operation using the timing chart in Fig. 5-32.

Input F ADV P (b) is made synchronous with rise or fall of RF SW P (a) by the system control microcomputer. START pulse is delayed by Ⓐ from F ADV P (b) in order to prevent noise when rising to normal play. (This delay time Ⓐis set by the IC internal counter.) START pulse from this IC351 is input to IC352 and after performing the 1 field slow operation, it is supplied to the capstan motor through the resistor and diode (D3515) to rotate the motor. By the motor rotation, FG pulse is generated and the speed control circuit starts operation. The control voltage is mixed with START pulse at D3515 and D3520.

When the motor rotation becomes the normal play speed or the duty of the speed control PWM becomes approx. 50 %, output of START pulse is stoped and the rotation speed later is maintained by the speed control.

When CTL pulse is detected during the normal play, the timing is sought for generating STOP pulse (c) by SLOW-FG-DELAY (e) with delay time Ⓑand the slow tracking delay by the system control microcomputer. With this delay, the still stop position free from noise is set. At this moment, FG counter for generating quasi CTL in IC352 is reset with CTL pulse and counting of doubled FG signal is started. When the counted value reaches 60, pulse is output as quasi CTL pulse to be used as CTL pulse in the next field. At the same timing as STOP pulse (c), REVERSE mode is set in with F/R signal to apply brake on the motor. When brake operation is started, the timing at which reverse rotation starts is detected with C FG (1) and C FG (2) signals whose output signal phase is shifted by 90° using the principle shown in Fig. 5-33 and F/R signal is risen. At the same time, after correcting the still position by rotating the motor normally by the amount of the reversed rotation with brake correction (h) with the delay time Ⓒset in the internal counter, STOP pulse (c) is fallen and tape play operation by 1 field without noise is finished. Fig. 5-34 shows the change in the capstan driving voltage in the course of time. By repeating this operation, intermittent slow and frame feeding operation are executed. For this Model, this operation is used while playing 12, 24H without sound, 48-960H ; and in reverse slow and in reverse frame feeding, the same control as in normal is performed by inverting MCFR, SWP input to IC352 and OROT output. It is used in playback.

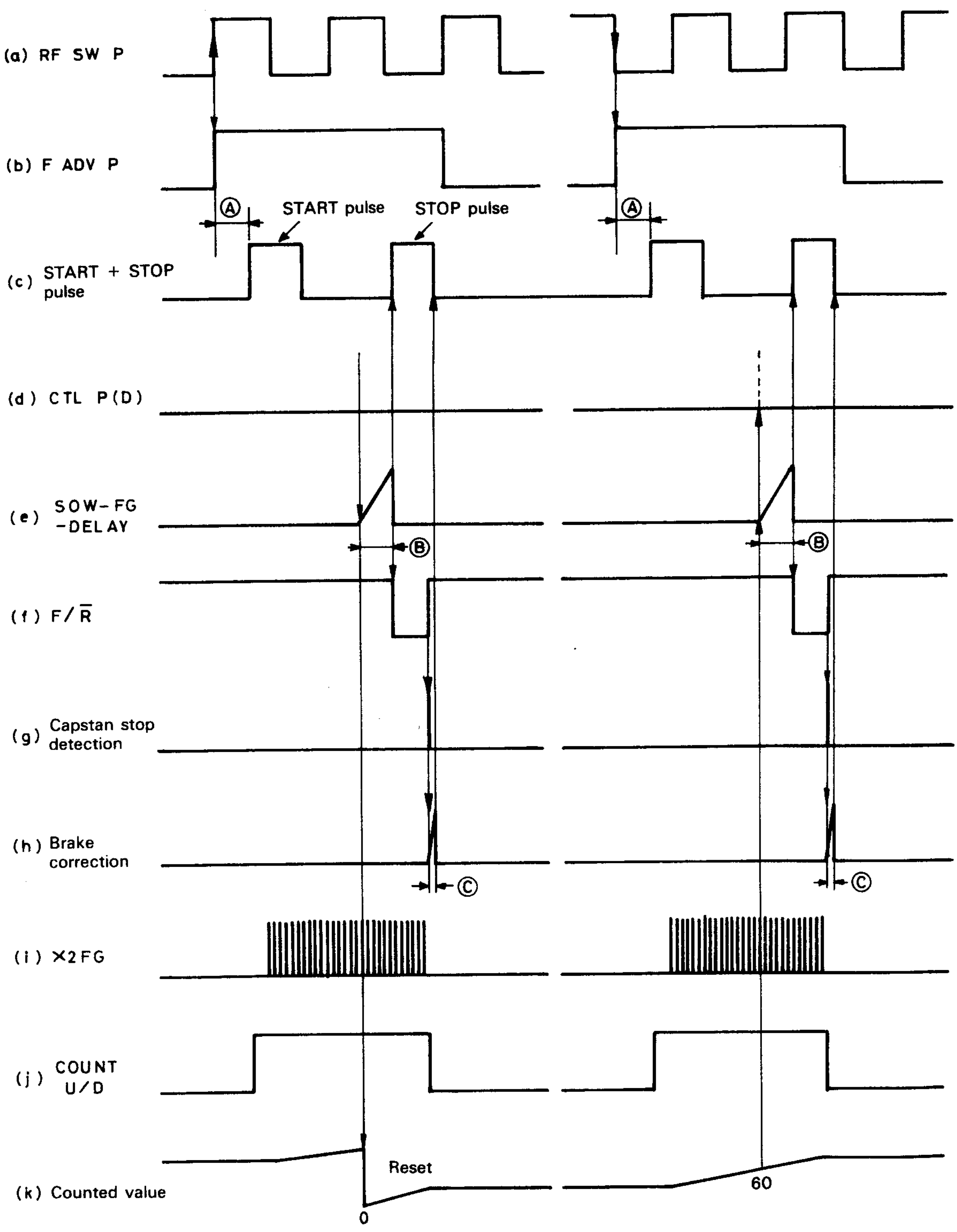

(a) RF SW P
(b) F ADV P
Ⓐ
START pulse
STOP pulse
(c) START + STOP pulse
(d) CTL P(D)
(e) SOW-FG -DELAY
Ⓑ
(f) F/R̄
(g) Capstan stop detection
(h) Brake correction
Ⓒ
(i) ×2FG
(j) COUNT U/D
(k) Counted value
Reset
0
60

Fig. 5-32

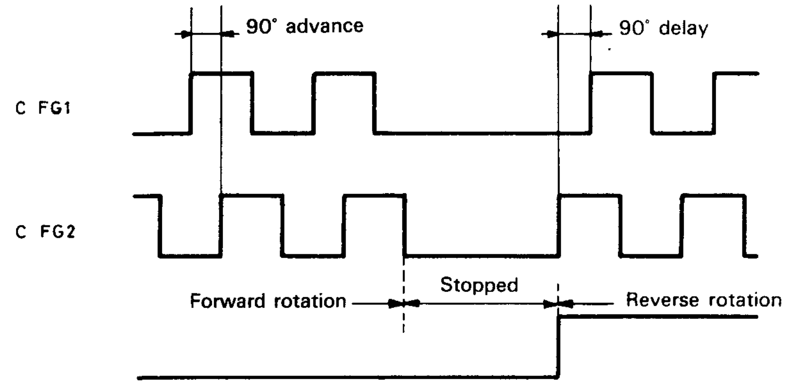

90° advance
90° delay
C FG1
C FG2
Forward rotation
Stopped
Reverse rotation

Fig. 5−33. Principle for recognizing capstan motor rotating direction

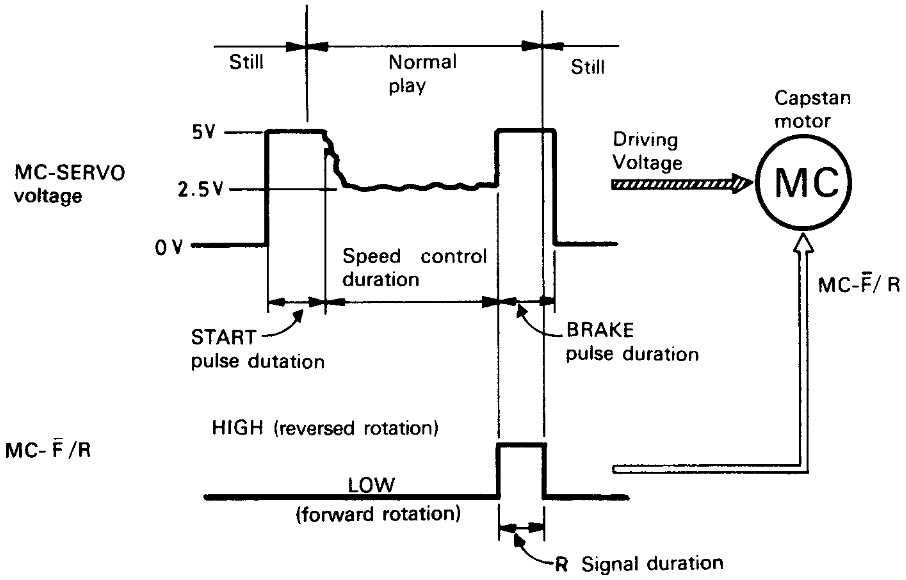

Still
Normal play
Still
MC-SERVO voltage
5V
2.5V
0 V
Speed control duration
START pulse dutation
BRAKE pulse duration
Driving Voltage
Capstan motor
MC
MC-F̄/R
MC-F̄/R
HIGH (reversed rotation)
LOW (forward rotation)
R Signal duration

Fig. 5−31. Change in driving voltage during intermittent drive

5-3-5. Time lapse record/playback control

(1) In RECORD

① 12H. 24H

For this model, in RECORD/PLAYBACK 12H, 24H mode, capstan motor is continuously driven as in 3H to feed tape. Therefore, the rotation number of the capstan motor in 12H mode and 24H mode are 1/4 and 1/8 of that in 3H and FG frequency outputs from the capstan motor in 12H and 24H are 378 Hz and 189 Hz respectively, which are low compared with 1513 Hz in 3H. Because of this, the speed control is performed by using the FG signal multiplied by 4 as show in Fig. 5-35 in 12H and 24H so that the stable speed control of the capstan motor can be performed.

On the other hand, exactly the same operation as in 3H is performed for the capstan phase, drum speed and phase. However, for the drum control, in order to reduce skew distortion in the playback picture, correction pulse is added through R3532 and D3514 to the control voltage after it is passed through the phase LPF and immediately before 1 field recording is performed and the rotation of the drum motor is thereby slightly changed.

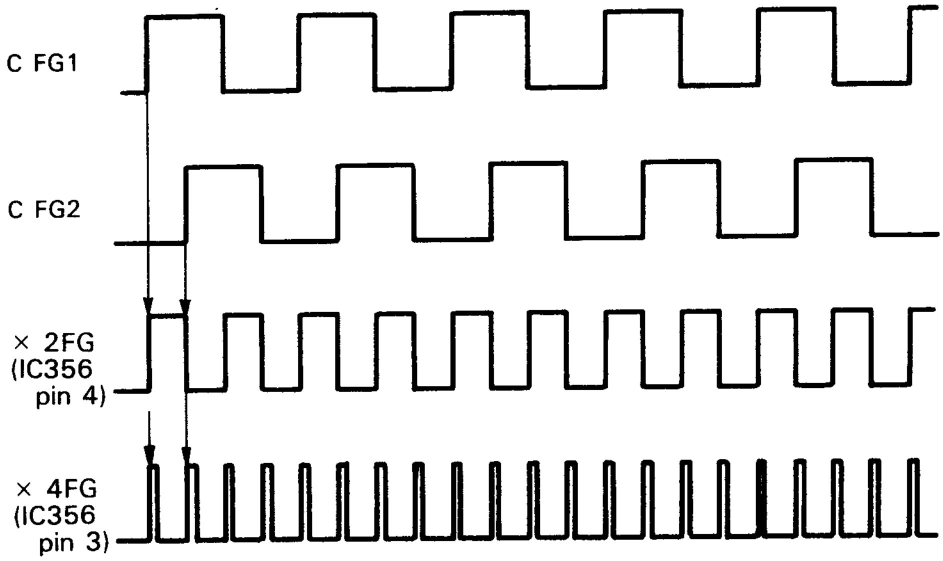


Fig. 5-35

② 48-960H

This Model's time lapse mode (12-960H) recording is of field recording type and every field is recorded as frame. Of 12-960H, in the range of 48-960H, tape is fed by intermittent drive and the slow control circuit is used as the control circuit. However, as CTL signal is not output in recording although it is output while playing, the circuit cannot be used as it is. Therefore, for this Model, FG signal of the capstan motor is counted while recording and quasi CTL signal is used to control.

As shown in Fig. 5-36, FG counter comprised of IC359 is reset at the rise of F ADV P and starts counting with doubled FG signal (× 2FG) obtained from × 4FG circuit comprised of IC356 ; and when the counted value becomes 32, quasi CTL pulse is output. Here, in order to simplify the circuit, the counter output is not fully decoded. Instead, output from 13-pin of IC359 is used as it is. The signal thus obtained is input to IC351 and used for intermittent drive control.

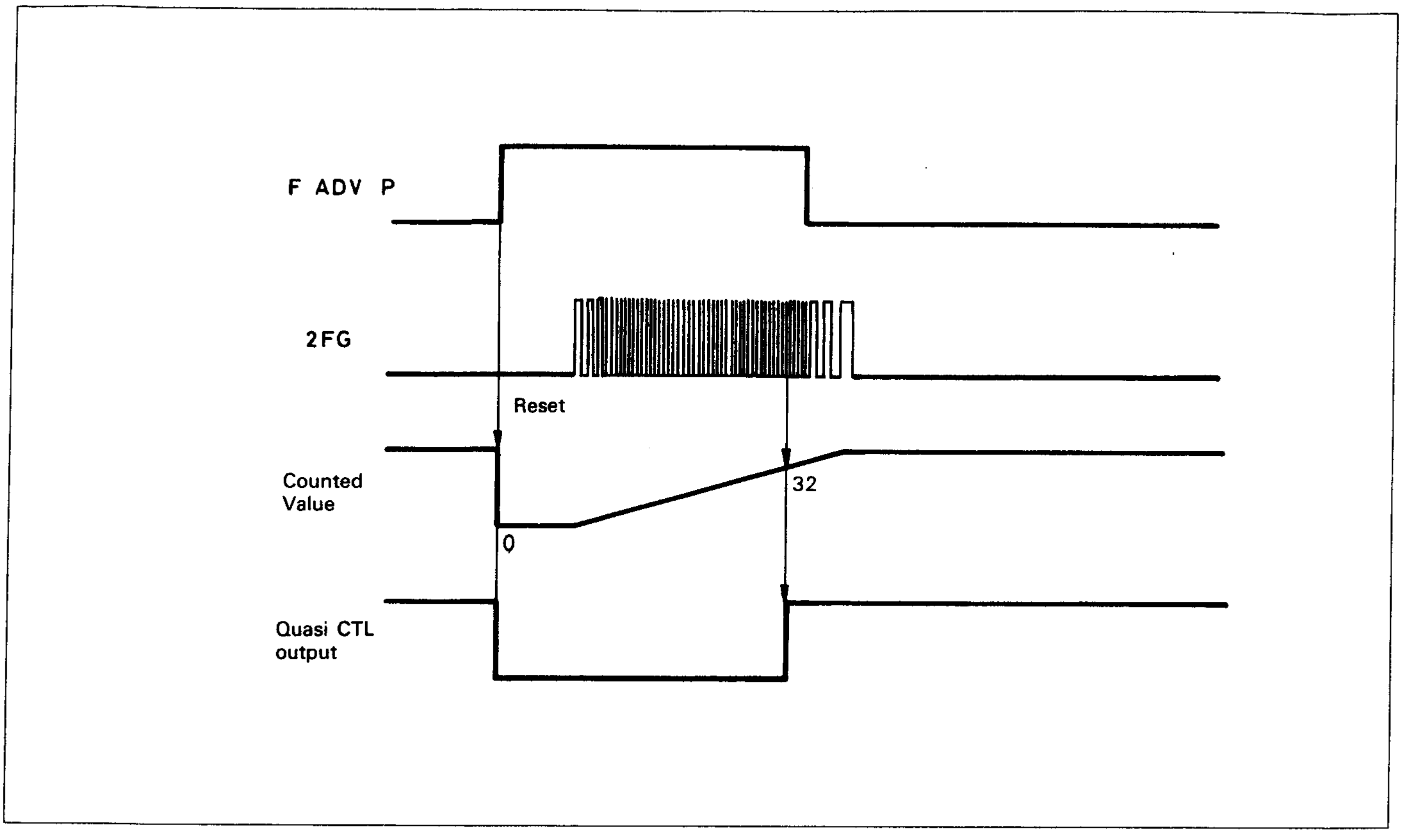


Fig. 5-36

(2) In PLAYBACK

① 12H, 24H (with sound)
The drum control in PLAYBACK is exactly the same as in 3H PLAYBACK. The capstan speed system is also controlled with FG signal multiplied by 4 (× 4FG) in the same way as in recording. In case of the capstan phase, as the frequency of CTL pulse becomes low (6.25 Hz, in 12H and 3.125 Hz in 24H) and the control accuracy is deteriorated, phase output fluctuation becomes large and deteriorated wow-flutter is anticipated. In order to resolve this ; the duty of the phase PWM output is fixed to 50 %, and the capstan motor is driven under the speed control only.

② 12H, 24H (without sound), 48-960H
Playback is performed with the above mentioned 1 field slow control.

6. SYSTEM CONTROL CIRCUIT

6–1. Outline of system control circuit

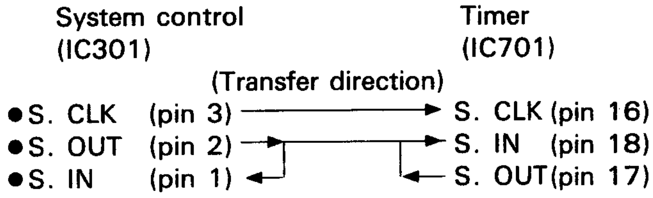
The system control circuit mainly comprises a one-chip microcomputer, and is mounted on the CP-A board.

6–1–1. ICs

- IC301(LC66516B-4933)
  This is a one-chip microcomputer of C-MOS, 4bits, and ROM capacity of 16k bytes, and it controls the mechanism, motors, and circuits (video, audio, servo, timer, power) according to the inputs from the buttons, switches, sensors, and pulses.
- IC302 (M51953A)
  This is a voltage detection system reset IC, and is used in resetting of the system control microcomputer (IC301).
- IC303 (LB1641)
  This is the IC for driving the motor, and is used in driving of the tape loading motor.
- IC304 (LA6393D)
  This is a dual comparator IC, and is used in waveform shaping of dew sensor signal.

6–2. Serial data communications

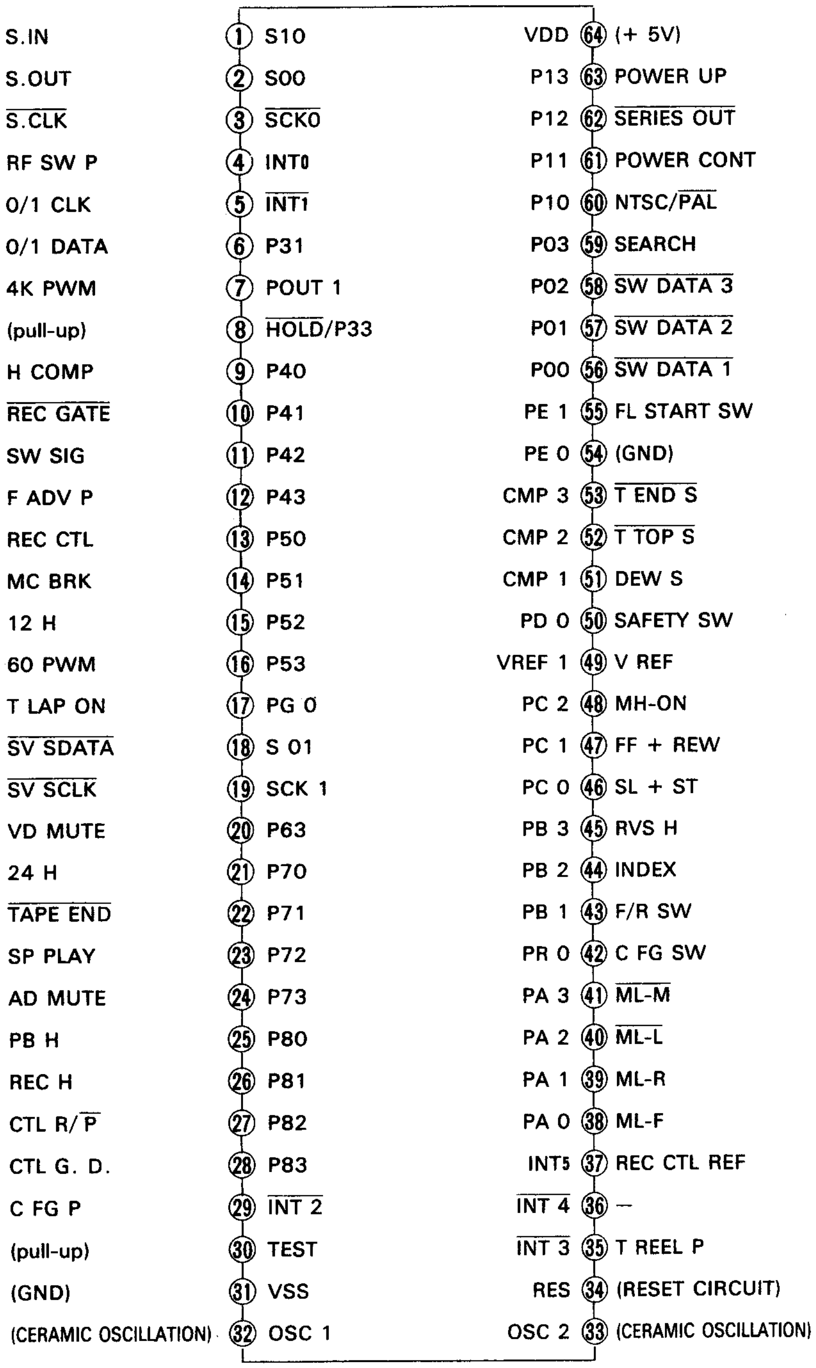
Serial data communications between the system control microcomputer (IC301) and the timer microcomputer (IC701) are performed through TL-SSB comprised of two lines of DATA and CLOCK. The followings are the outline of TL-SSB data blocks, data format, and timing specifications.



6−3. Functions by terminals

Pin location of system control microcomputer and its functions by terminals are shown in Tables 6−1 and 6−2 respectively.

a) Pin allocation



S.IN	①	S10	VDD	(64)	(+ 5V)
S.OUT	②	S00	P13	(63)	POWER UP
$\overline{\text{S.CLK}}$	③	$\overline{\text{SCK0}}$	P12	(62)	$\overline{\text{SERIES OUT}}$
RF SW P	④	INT0	P11	(61)	POWER CONT
0/1 CLK	⑤	$\overline{\text{INT1}}$	P10	(60)	NTSC/$\overline{\text{PAL}}$
0/1 DATA	⑥	P31	P03	(59)	SEARCH
4K PWM	⑦	POUT 1	P02	(58)	$\overline{\text{SW DATA 3}}$
(pull-up)	⑧	$\overline{\text{HOLD}}$/P33	P01	(57)	$\overline{\text{SW DATA 2}}$
H COMP	⑨	P40	P00	(56)	$\overline{\text{SW DATA 1}}$
$\overline{\text{REC GATE}}$	⑩	P41	PE 1	(55)	FL START SW
SW SIG	⑪	P42	PE 0	(54)	(GND)
F ADV P	⑫	P43	CMP 3	(53)	$\overline{\text{T END S}}$
REC CTL	⑬	P50	CMP 2	(52)	$\overline{\text{T TOP S}}$
MC BRK	⑭	P51	CMP 1	(51)	DEW S
12 H	⑮	P52	PD 0	㊿	SAFETY SW
60 PWM	⑯	P53	VREF 1	㊾	V REF
T LAP ON	⑰	PG 0	PC 2	㊽	MH-ON
$\overline{\text{SV SDATA}}$	⑱	S 01	PC 1	㊼	FF + REW
$\overline{\text{SV SCLK}}$	⑲	SCK 1	PC 0	㊻	SL + ST
VD MUTE	⑳	P63	PB 3	㊺	RVS H
24 H	㉑	P70	PB 2	㊹	INDEX
$\overline{\text{TAPE END}}$	㉒	P71	PB 1	㊸	F/R SW
SP PLAY	㉓	P72	PR 0	㊷	C FG SW
AD MUTE	㉔	P73	PA 3	㊶	$\overline{\text{ML-M}}$
PB H	㉕	P80	PA 2	㊵	$\overline{\text{ML-L}}$
REC H	㉖	P81	PA 1	㊴	ML-R
CTL R/$\overline{\text{P}}$	㉗	P82	PA 0	㊳	ML-F
CTL G. D.	㉘	P83	INT5	㊲	REC CTL REF
C FG P	㉙	$\overline{\text{INT 2}}$	$\overline{\text{INT 4}}$	㊱	−
(pull-up)	㉚	TEST	$\overline{\text{INT 3}}$	㉟	T REEL P
(GND)	㉛	VSS	RES	㉞	(RESET CIRCUIT)
(CERAMIC OSCILLATION)	㉜	OSC 1	OSC 2	㉝	(CERAMIC OSCILLATION)

LC66516B

b) Option switching

① NTSC/PAL : HIGT ··· NTSC
LOW ··· PAL

② POWER CONT : HIGH ··· POWER SW : not effective (No POWER ON/OFF)
LOW ··· POWER SW : effective (POWER ON/OFF)

Fig. 6−1.

Table 3-2.

PIN NO.	PORT NAME	INPUT/OUTPUT NAME	I/O	INPUT, OUTPUT SIGNAL FUNCTION
1	SI 0	S. IN	I	Input of serial data from timer microcomputer.
2	SO 0	S. OUT	O	Output of serial data to timer microcomputer.
3	$\overline{\text{SCK 0}}$	$\overline{\text{S. CLK}}$	O	Output of clock signal for adjusting the timing of serial transfer to timer microcomputer.
4	INT 0	RF SW P	I	Input of head changeover signal used for timing of the servo circuit and detecting of rotation of drum.
5	$\overline{\text{INT 1}}$	0/1 CLK	I	Input of CTL pulse used for detecting of no-signal part of tape and 48-960H playback tracking.
6	P31	0/1 DATA	I	CTL pulse "0" or "1" data (for VISS,VASS).
7	P OUT 1	4k-PWM	O	Not use.
8	$\overline{\text{HOLD}}$/P33	(Pull-up)	I	Fixed at HIGH (pull-up to 5 V).
9	P40	H COMP	O	Signal output for correction of drum rotating speed in intermittent recording.
10	P41	$\overline{\text{REC GATE}}$	O	Signal to indicate video head recording in REC mode.
11	P42	SW SIG	O	Pulse output every recording of one field.
12	P43	F ADV P	O	Intermittent output of pulse synchronizing with RF SWP in each mode of STILL, F ADV, 48 – 960H REC/PLAY.
13	P50	REC CTL	O	Output of control signal for recording.
14	P51	MC BRK	O	Signal to indicate braking of rotation of capstan motor (MC).
15	P52	12 H	O	"H" output in REC 2 mode 12 H RECORD and PLAY 2 mode 12 H continuous PLAYBACK.
16	P53	60 PWM	O	Signal to switch capstan FG signal.
17	P60	T LAP ON	O	Output in 12 – 960 H RECORD.
18	S01	$\overline{\text{SV SDATA}}$	O	Serial output data to SV IC.
19	$\overline{\text{SCK 1}}$	$\overline{\text{SV SCLK}}$	O	Serial output clock to SV IC.
20	P63	VD MUTE	O	Signal to prohibit playback screen output in ALARM SEARCH, ALARM SCAN, and T/D SEARCH.
21	P70	24 H	O	"H" output in REC 2 mode 24 H RECORD and PLAY 2 mode 24H continuous PLAYBACK.
22	P71	$\overline{\text{TAPE END}}$	O	Output when T END S input in RECORD.
23	P72	SP PLAY	O	Output in special PLAYBACK (Back and forth SEARCH, STILL, F. ADV, PLAY 3, etc.).
24	P73	AD MUTE	O	Signal to prohibit audio output/playback output.
25	P80	PB H	O	Output in the mode of delivering reproduced picture.
26	P81	REC H	O	Signal to indicate record, and output in REC mode.
27	P82	CTL R/$\overline{\text{P}}$	O	Signal to indicate record/play of CTL AMP.
28	P83	CTL G. D.	O	CTL AMP GAIN changeover signal.
29	$\overline{\text{INT 2}}$	C FG P	O	Pulse of 0-6kHz approx. Required frequency : 1kHz.
30	TEST	(GND)	I	Connected to ground.
31	Vss	(GND)		Connected to ground.
32	OSC 1	Ceramic oscillation	I	Clock oscillation terminal.
33	OSC 2	Ceramic oscillation	O	Clock oscillation terminal
34	RES	Reset circuit	I	Reset signal input for initializing
35	$\overline{\text{INT 3}}$	T REEL P	I	Pulse of 0 – 500 Hz approx. The rotation of TAKE reel stand changes the cycle.
36	$\overline{\text{INT 4}}$	–	I	
37	INT 5	REC CTL REF	I	Pulse of 30 (or 25) Hz. Reference signal of REC CTL output in REC.
38	PA 0	ML-F	O	Signal to indicate rotation of tape loading motor (ML) in normal direction.
39	PA 1	ML-R	O	Signal to indicate rotation of tape loading motor (ML) in reverse direction.
40	PA 2	$\overline{\text{ML-L}}$	O	Signal to indicate low speed rotation of tape loading motor (ML).

Table 3−2 (Continued)

PIN NO.	PORT NAME	INPUT/OUTPUT NAME	I/O	INPUT, OUTPUT SIGNAL FUNCTION
41	PA 3	$\overline{\text{ML-M}}$	O	Signal to indicate medium speed rotation of tape loading motor (ML).
42	PB 0	C FG SW	O	Capstan FG switch signal to change over frequency division.
43	PB 1	F/R SW	O	Signal to indicate the rotating direction of capstan motor. ("H" in normal rotation.)
44	PB 2	INDEX	O	CTL pulse changeover signal to detect VISS/VASS signal in ALARM. T/D SEARCH.
45	PB 3	RVS H	O	Output of SV serial output MC-F/R as it is.
46	PC 0	SL + ST	O	Output in each mode of STILL, R. STILL, PLAY 3, R-PLAY 3, F-ADV, R-F-ADV.
47	PC 1	FF + REW	O	Output in FF or REW mode. (For changeover of MIX AMP GAIN)
48	PC 2	MH-ON	O	Output of SV serial output MH-ON as it is.
49	VREF 1	V REF	I	Reference voltage input for sensor comparator input.
50	PD 0	SAFETY SW	I	SW to judge if the cassette is recordable or not.
51	CMP 1	DEW S	I	Sensor input to detect dew condensation. The input signal becomes HIGH when dew condensation is detected.
52	CMP 2	$\overline{\text{T TOP S}}$	I	Sensor input to detect the beginning of tape.
53	CMP 3	$\overline{\text{T END S}}$	I	Sensor input to detect the end of tape.
54	PE 0	(GND)	I	Connected to ground.
55	PE 1	FL START SW	I	SW for front loading mechanism. (Changes when front loading starts.)
56	P 00	$\overline{\text{SW DATA 0}}$	I	SW to indicate mechanism position.
57	P 01	$\overline{\text{SW DATA 1}}$	I	SW to indicate mechanism position.
58	P 02	$\overline{\text{SW DATA 2}}$	I	SW to indicate mechanism position.
59	P 03	SEARCH	O	Output in SEARCH (CUE, REV).
60	P 10	NTSC/$\overline{\text{PAL}}$	I	For changeover of NTSC/PAL.
61	P 11	POWER CONT	I	For changeover of POWER ON/OFF.
62	P 12	$\overline{\text{SERIES OUT}}$	O	Output just before the tape end in RECORD.
63	P 13	POWER UP	O	Output except for POWER OFF mode.
64	VDD	(+ 5 V)		5 V power supply terminal

6-4. Circuit operation

6-4-1. Sensors

This apparatus comprises the following sensors for detecting abnormality.

① DEW sensor
For detection of dew condensation in the mechanism around the head drum.

② TAPE TOP, TAPE END sensor
For detection of beginning and end of tape.

③ REEL sensor
For detection of rotation of the reel stand, checking if the tape is taken up or not.

④ Drum sensor
For detection of rotation of head drum.

⑤ SAFETY SW
For detection of presence/absence of foolproof tab of the cassette.

⑥ Cassette loading sensor
For detection of loaded cassatte tape into the VTR.

(1) Operation of sensor circuits

① Dew sensor
The dew sensor is an element which varies in its resistance depending on the humidity ; and by detecting the resistance change as a voltage change, dew condensation is detected.
The impedance of dew sensor is normally 0 Ω ; but in case of dew condensation, the value gradually increases. This impedance change is converted to a voltage change, and when "H" is detected by IC304, 0.4 V and more approx., the operation STOPs as it is in dew condensation.

② Tape top sensor
A photo transistor is used for the tape top sensor, and by detecting the light from the LED passing through the transparent leader part at the beginning of the tape reel, a signal is emitted. When this signal is detected in REW, RVW, or RVS PLAY mode, the mechanism is set in STOP mode after a short FF operation.

③ Tape end sensor
Same as the tape top sensor, the tape end sensor detects the transparent leader part at the end of the tape reel by means of a photo transistor. When the tape end signal is detected in FF, PLAY, REC, F ADV mode, the operation is changed to REW mode.

④ Reel sensor
This is to detect the light reflected from the reflection pattern provided beneath the take-up side reel stand to deliver pulses. By counting the cycle of the pulses, it is checked if the tape is taken up correctly or not.

⑤ Drum sensor
When the drum rotating speed drops while the tape is running, the tape may be damaged. To prevent this damage, the drum sensor detects the rotating speed of the drum, by measuring the cycle of RF SW P from the servo circuit.

⑥ Cassette loading sensor
Exclusive circuit is not provided, but the cassette loading is detected by tape top sensor and tape end sensor. When at least one of the tape top sensor and tape end sensor is in OFF state, it means the cassette is loaded.

6-4-2. Functions

The system control microcomputer has the following functions by the data like operation key from the serial data (TL-SSB) of the timer microcomputer and by some senser signal inputs.

(1) AUTO functions

① AUTO REW
When tape end sensor input in the FORWARD running mode, the mechanism is automatically changed to REW mode to rewind the tape.

② AUTO EJECT
When a cassette without foolproof tab is loaded (SAFETY SW is OFF), if the REC key is pressed or the timer SW is turned ON, the cassette is automatically ejected.

③ OFF POWER EJECT
When EJECT key is pressed at POWER OFF, POWER is ON ; and after cassette is out, POWER is OFF again.

④ AUTO POWER ON
When cassette is inserted at POWER OFF, POWER is automatically ON.

(2) Timer recording

This records at the time and the speed set by the timer microcomputer.

(3) Record/playback changeover

Both record and playback can be selected as follows : 3, 12, 24, 48, 72, 96, 120, 168, 480, 720, 960 H. In playback, select shorter speed than the speed in record, and then it is fast forwarding playback. When longer speed is selected, it is slow playback.

(4) Linear time counter

① Counting
0/1 DATA (CTLP) rising in PLAYBACK and every 2 field record in RECORD is 1 count each, and time indication (hour, minute, second) in counting is made by regarding 25 counts as 1 sec. COUNTER UP/DOWN signal depends on the operation mode in the system control microcomputer to count up or down. The counter data is transfered to the timer microcomputer in serial data (TL-SSB) for counter indication.

② Counter memory
When counter memory mode is set, the operation is changed to STOP mode at the counter indication 0 H 00 M 00 S.

③ Program selecting
VISS signal (one of program selecting signals in VHS system) is recorded when alarm signal is input, and it is detected in FF/REW for alarm search and alarm scan. VASS signal is recorded at 0 minute every hour to be detected for T/D search.

④ Alarm scanning
Press SEARCH/REV button in STOP mode to select ALARM SCAN mode and then REW of FF button to start alarm scanning. Perform detecting process of VISS signal in FF or REW mode. When VISS signal is detected, the operation is changed to PLAY mode. The PLAY mode lasts for 5 seconds. If PLAY button is input in this PLAY mode, ALARM SCAN mode ends and PLAY mode continues.
Unless PLAY button is input ; after 5 seconds , the operation starts to detect the next VISS signal to repeat the above.

⑤ Alarm searching
Press SEARCH/REV button is STOP mode to select ALARM SEACH mode and press COUNTER RESET "−" or COUNTER MEMORY "+" to select the detected number. Press REW or FF buttom to start alarm searching. Detecting process of VISS signal is performed in FF or REW mode. When VISS signal is detected, the value is reduced from the set number. The operation is changed to STILL mode at "0" indication of VISS signal to end alarm searching.

⑥ T/D (TIME/DATE) searching
Press SEARCH/REV button in STOP mode to select T/D SEARCH mode and press COUNTER RESET "−" or COUNTER MEMORY "+" to select detected time. Press REW or FF button to start T/D searching. Detecting process of VASS signal is performed in FF or REW mode. THe operation is changed to STILL mode at the set time of VASS signal to end T/D searching.

(5) Other functions

① REPEAT REC
If there is a tape end sensor input during REC, the mechanism is changed to REW mode, and when tape top sensor input is performed, the operation is once stopped, and then REC operation is resumed.

② ALARM REC
ALARM SW input from the timer starts or ends recording and changes the tape speed.

③ Power failure recovery processing
When recovering from power failure, depending on the content of the serial data from the timer, the tape speed before the power failure is restored, and when the operation before power failure was REC mode, REC operation is resumed.

6−5. Major output signals

6−5−1. Intermittent record, playback output signal

The timing charts of input signal of RF SW P and output signals of REC GATE, F ADV P, REC CTL, H COMP in intermittent record, playback (48 − 960 H) are shown in Fig. 6−1. All signals are delivered in RECORD mode, and only F ADV P is delivered in PLAY mode. In the diagram, N and M denote the time from rise to fall of H COMP signal, as expressed by the number of pieces of RF SW P half-cycle (1 field). Supposing the tape speed to be T (H), the time is calculated as N = T/3, M = T/3 − 2. Table 6−3 shows the values of N and M at each tape speed.

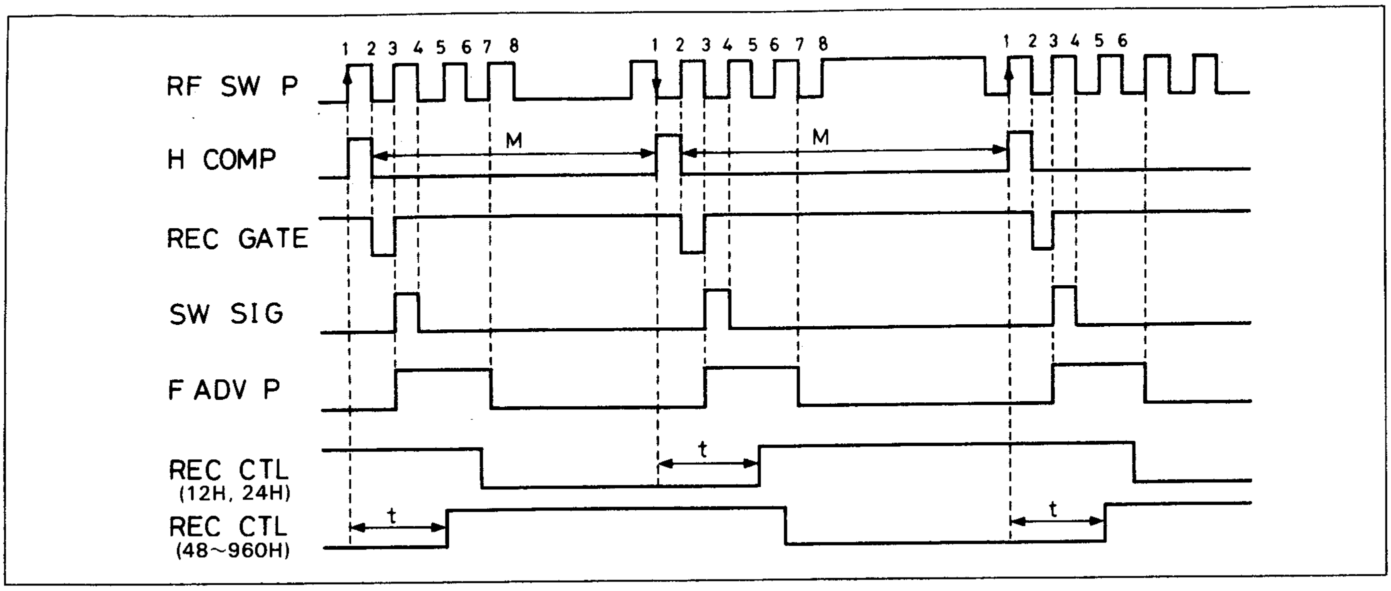

RF SW P
H COMP
REC GATE
SW SIG
F ADV P
REC CTL (12H, 24H)
REC CTL (48~960H)
1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8
1 2 3 4 5 6
M
M
t
t
t

Fig. 6−1

When N and M in the figure is expressed by the number of pieces of RF SW P half-cycle, and t by the number of pieces of FG P :

Tape speed	N		M		t	
	NTSC	PAL	NTSC	PAL	NTSC	PAL
12H (REC)	6	4	4	2	12	10
24H (REC)	12	8	10	6	9	8
48H	24	16	Same as N.		7	7
72H	36	24				
96H	48	32				
120H	60	40				
168H	84	56				
240H	120	80				
480H	240	160				
720H	360	240				
960H	480	320				

Table. 6−3

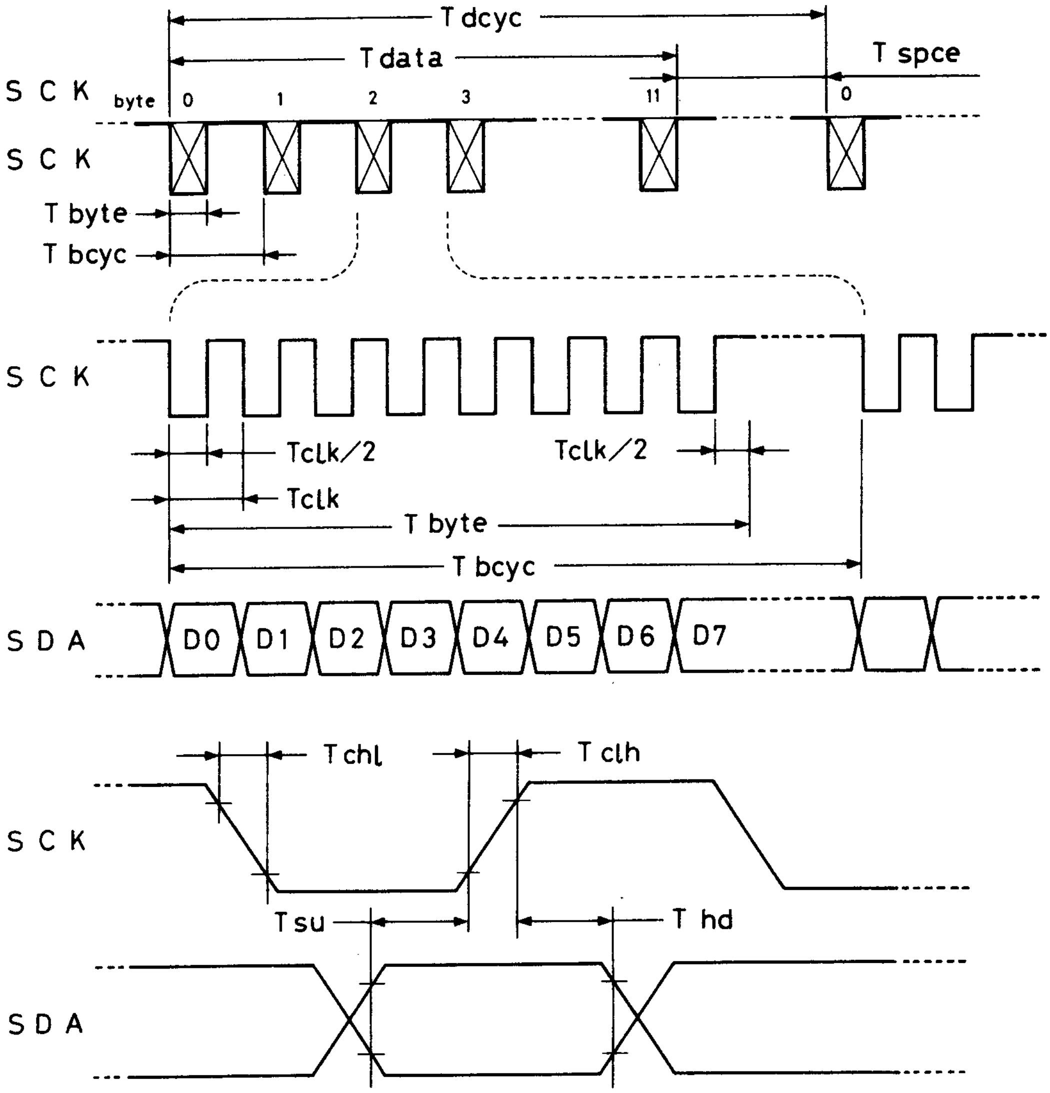
SIGNAL FORMAT

- Table of block signals

(B : Block, D : bit, S : SOURCE)

B	D	Signal	S	B	D	Signal	S
0	0	KEY	Each Microcomputers	6	0	DISPLAY DATA B	Each Microcomputers
	1	〃			1	〃	
	2	〃			2	〃	
	3	〃			3	〃	
	4	〃			4	〃	
	5	〃			5	〃	
	6	〃			6	〃	
	7	〃			7	〃	
1	0	MODE	System control	7	0	TAPE SPEED B	System control
	1	〃			1	〃	
	2	〃			2	〃	
	3	〃			3	〃	
	4	〃			4	REPEAT REC	
	5	〃			5	〃	
	6	HOLD			6	REC ST-BY	
	7	POWER ON			7	ALARM REC	
2	0	TAPE SPEED A	System control	8	0	ALARM SW	Timer
	1	〃			1	〃	
	2	SYSTEM RESET PROCESS			2	〃	
	3	SAFETY SW			3	PRE ALARM MODE	
	4	MH-ON			4	PRE POWER FAILURE MODE	
	5	DEW			5	REPEAT REC SW	
	6	PLAY BACK			6	〃	
	7	COUNTER MEMORY			7	SERIES IN	
3	0	TIMER PROGRAM	Timer	9	0	ONE SHOT FIELD	Timer
	1	TIMER SW			1	〃	
	2	EXEC TIMER			2	〃	
	3	PROGRAM MODE			3	HEADER	
	4	OSD ON			4	ALARM COUNT	
	5	REC REWIND			5	〃	
	6	P. F. RETURN DATA			6	〃	
	7	T-160 SW			7	〃	
4	0	DISPLAY SOURCE A SELECT	Each Microcomputers	10	0	SOURCE DEVICE	Each Microcomputers
	1	〃			1	〃	
	2	〃			2	—	
	3	USE 10 KEY			3	—	
	4	DISPLAY SOURCE B SELECT			4	ERROR CODE	
	5	〃			5	〃	
	6	TIMER REC			6	〃	
	7	CHARACTER OFF			7	〃	
5	0	DISPLAY DATA A	Each Microcomputers	11	0	CHARACTER INSERT	Each Microcomputers
	1	〃			1	SOURCE DEVICE	
	2	〃			2	〃	
	3	〃			3	CHARACTER MODE	
	4	〃			4	CHARACTER DATA	
	5	〃			5	〃	
	6	〃			6	〃	
	7	〃			7	〃	

Timing


T dcyc
T data
T spce
S C K
byte 0 1 2 3 11 0
S C K
T byte
T bcyc
S C K
Tclk/2
Tclk/2
Tclk
T byte
T bcyc
S D A
D0
D1
D2
D3
D4
D5
D6
D7
T chl
T clh
S C K
T su
T hd
S D A

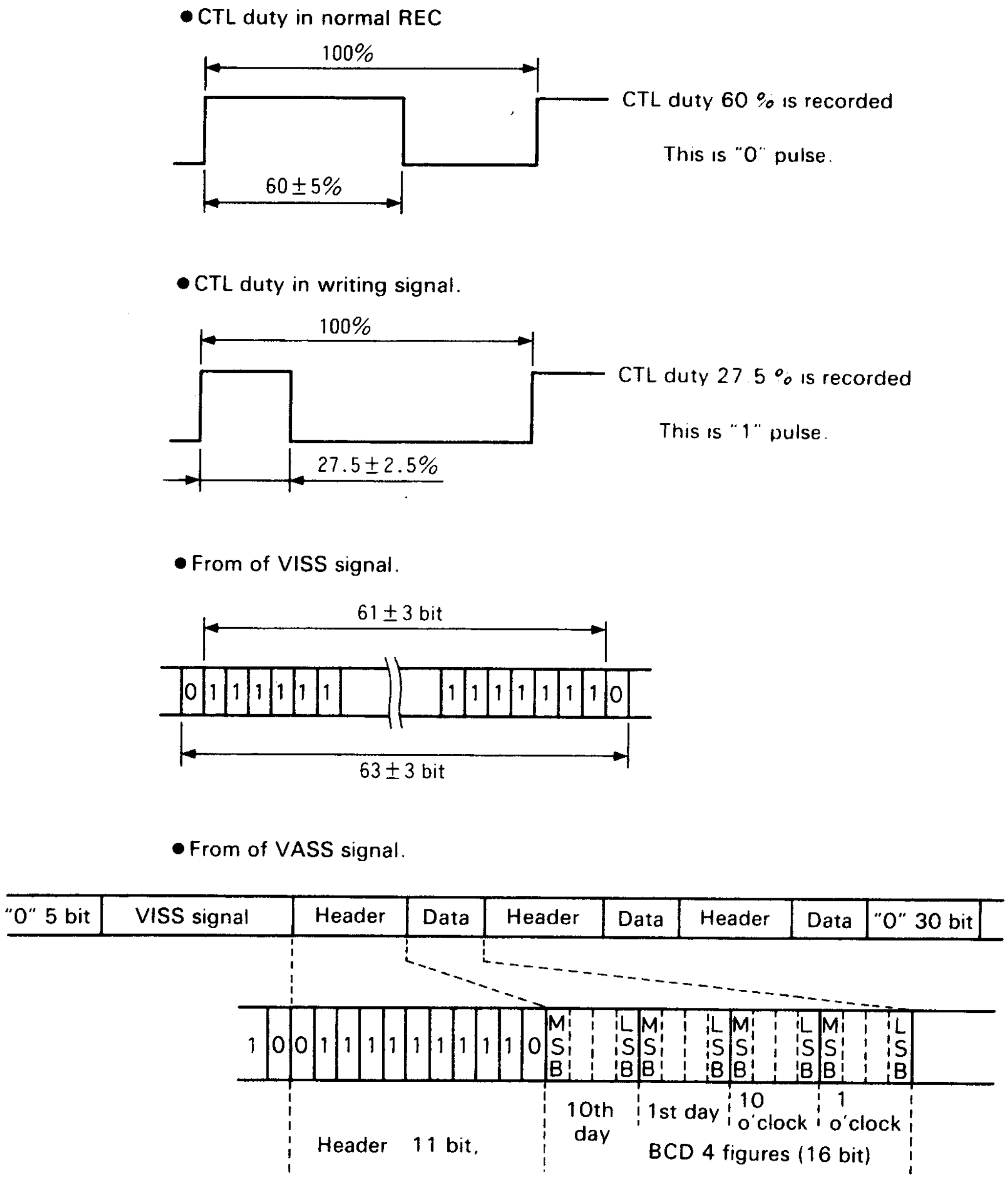
Characteristic	Symbol	MAX	STD.	MIN	Unit
Data Cycle Time	T dcyc	16.896	15.360	13.824	ms
Data Area Width	T data	12.531	11.392	10.253	ms
Byte Width	T byte	281.6	128	115.2	μs
Byte Cycle Time	T bcyc	1126.4	1024	921.6	μs
Clock-pulse Cycle Time	T clk	35.2	16	14.4	μs
Clock-pulse Rise Time	T clh	3	–	–	μs
Clock-pulse Fall Time	T chl	3	–	–	μs
Data Setup Time	T su	–	–	1	μs
Data Hold Time	T hd	–	–	1	μs
Data Space Width	T spce	–	–	3.571	ms

6–5–2. Record signal for program selecting

Program selecting (VISS, VASS) adopted in VHS system changes the duty factor of CTL signal to record in video tape CTL track and records as the program selecting (VISS, VASS) signal. These signals are detected in FF or REW mode to search out quickly the required record.

The CTL signal duty factor in VISS and VASS signals recorded is shown in Fig. 6–3. "1" pulse (CTL duty 27.5 %) input to No. 6 pin 0/1 DATA terminal is detectid 61 ± 3 bit continuously, and then it is processed as VISS signal in case without a header and as VASS signal in case with a header.

Controlling of duty in record is made as shown in Fig. 6–3. CFGP is counted at rise of REC-CTL signal ; falling at 18 counts in case of "0" pulse and at 8 counts in case of "1" pulse.



● CTL duty in normal REC
100%
60±5%
CTL duty 60 % is recorded
This is "0" pulse.
● CTL duty in writing signal.
100%
27.5±2.5%
CTL duty 27.5 % is recorded
This is "1" pulse.
● From of VISS signal.
61±3 bit
0 1 1 1 1 1 1 1 1 1 1 1 1 1 0
63±3 bit
● From of VASS signal.
"0" 5 bit
VISS signal
Header
Data
Header
Data
Header
Data
"0" 30 bit
1 0 0 1 1 1 1 1 1 1 1 1 0
MSB
LSB
MSB
LSB
MSB
LSB
MSB
LSB
Header 11 bit,
10th day
1st day
10 o'clock
1 o'clock
BCD 4 figures (16 bit)

- In recording 3 data for the same time is recorded ; and in detecting the effective data is the one that has more than two agreements of the three.

Fig. 6–2

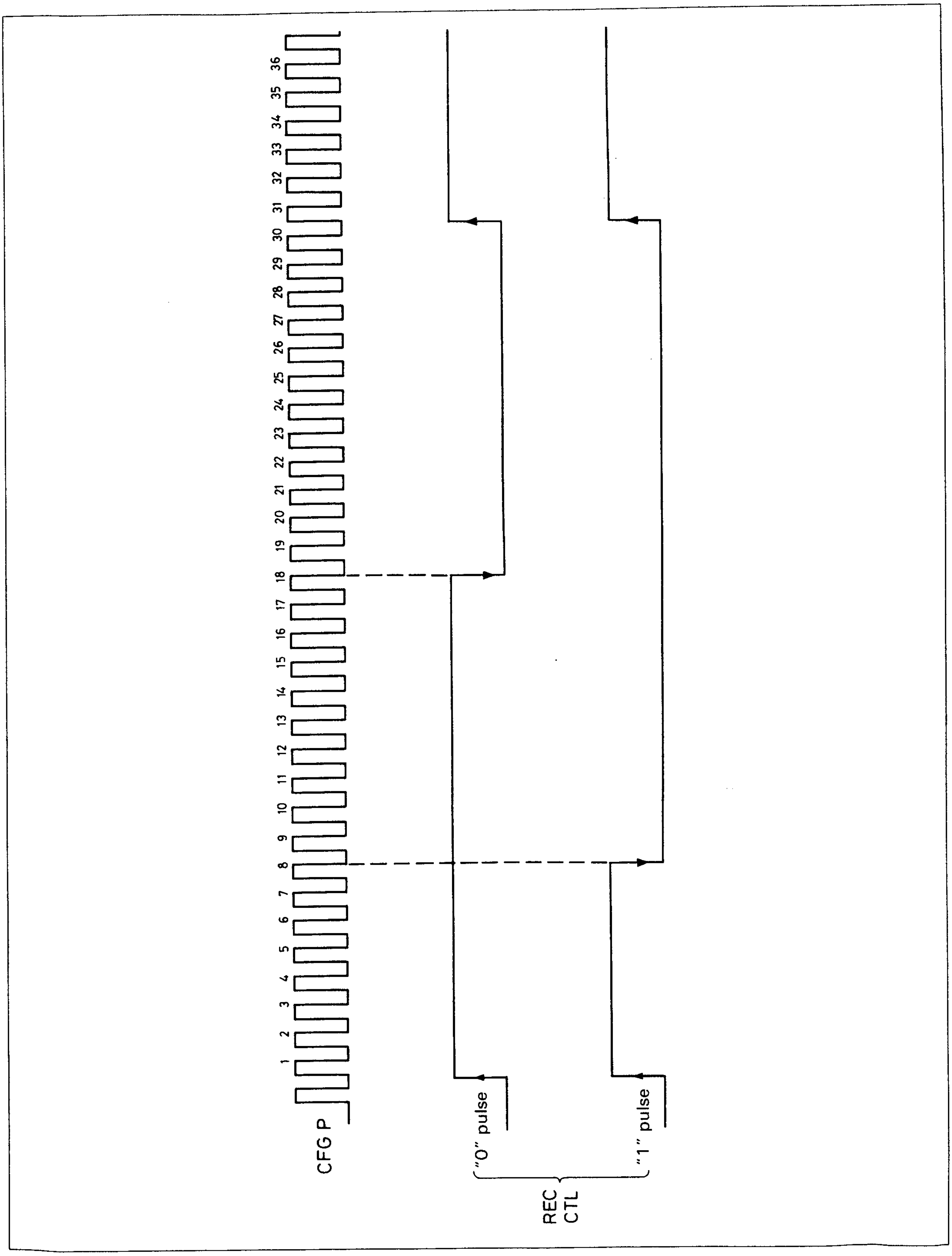

CFG P
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
"0" pulse
"1" pulse
REC CTL

Fig. 6−3

7.TIMER CIRCUIT

7−1. Outline

7−1−1. Configuration

As shown in Fig. 7−1, the timer circuit is comprised from three PCB's, TM-1, TM-2, and TM-A and the circuit is made up of MPU, FLT, KEY MATRIX, remote control decoder and character generator.

7−1−2. Simple description of the block diagram

FLT is turned on by GRID output and SEGMENT output. On the other hand, GRID output is consisted of key matrix and a lot of key input is taken in. As for key input taking, not only timer information but also the system control information is taken in. The system control information taken in is sent to the system control by serial transfer.

Of the timer information input with keys, the one regarding on the screen is processed by MPU and in order to make display, the same information is transferred to the character generator to generate characters. Then it is synthesized with the image signal in VD-A, on-screen circuit.

The remote control input from VD-A is first decoded by the decoder of TM-A and then sent to MPU in 4-bit parallel signal to be processed there.

Alarm input is input from TB-1, which is inverted by TM-A and sent to MPU. Then it is processed to be alarm REC in MPU and output from MPU during the alarm period. This signal is inverted by TM-A and then output.

The current from power source goes through TM-A once and goes to TM-1 only in cases it is necessitated.

This microcomputer has two lines of clocks, which are respectively used for normal operation and operation during power failure.

7−2. Details

The main component of the timer circuit is the timer microcomputer (MPU) and other circuits are provided as peripheral circuits. Therefore, both the function of the timer microcomputer and the peripheral circuits are described here.

7−2−1. Port allocation of the microcomputer

Fig. 7−2 and Table 7−1 show the port allocation of the microcomputer and I/O chart of the ports.

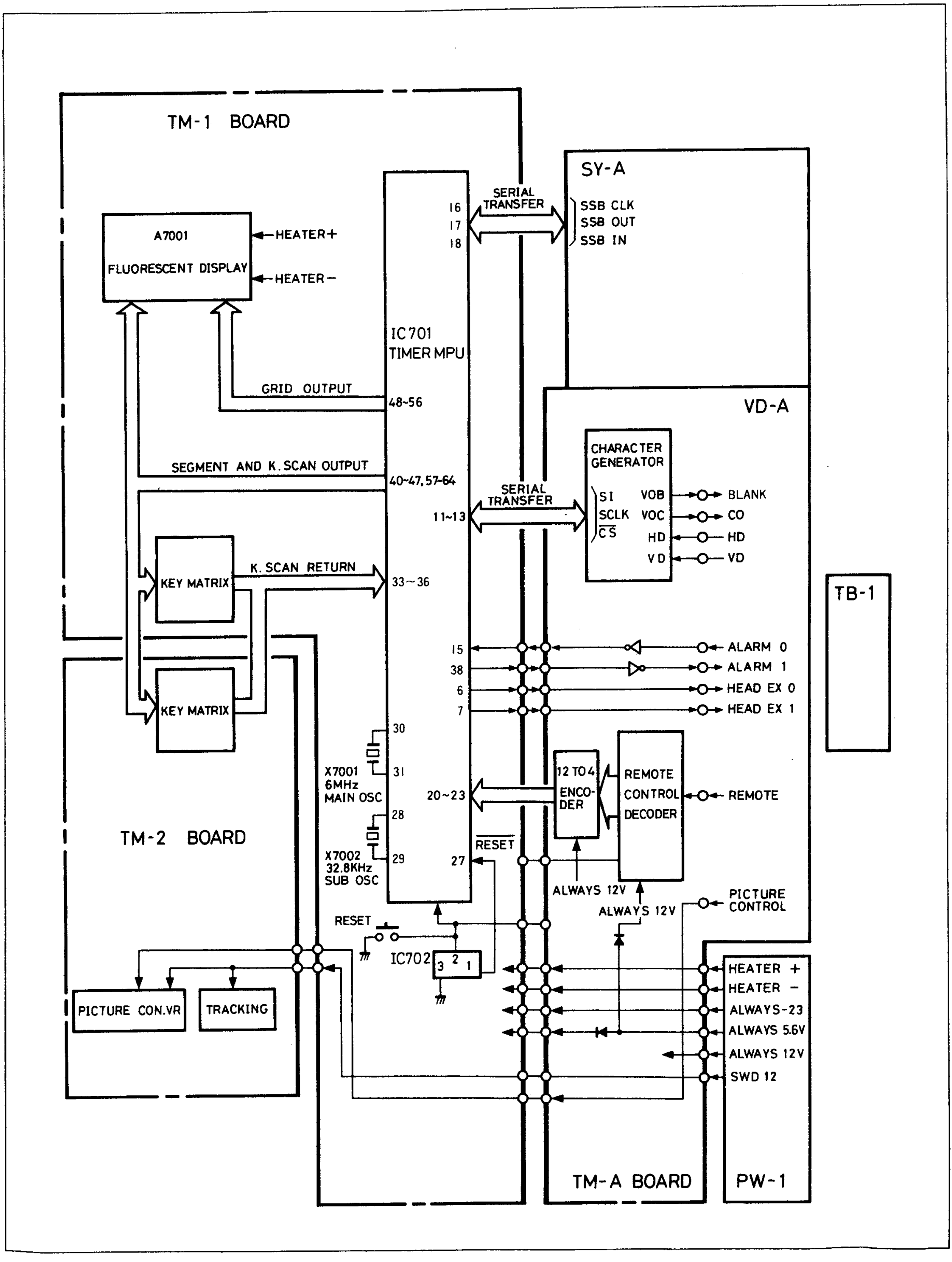
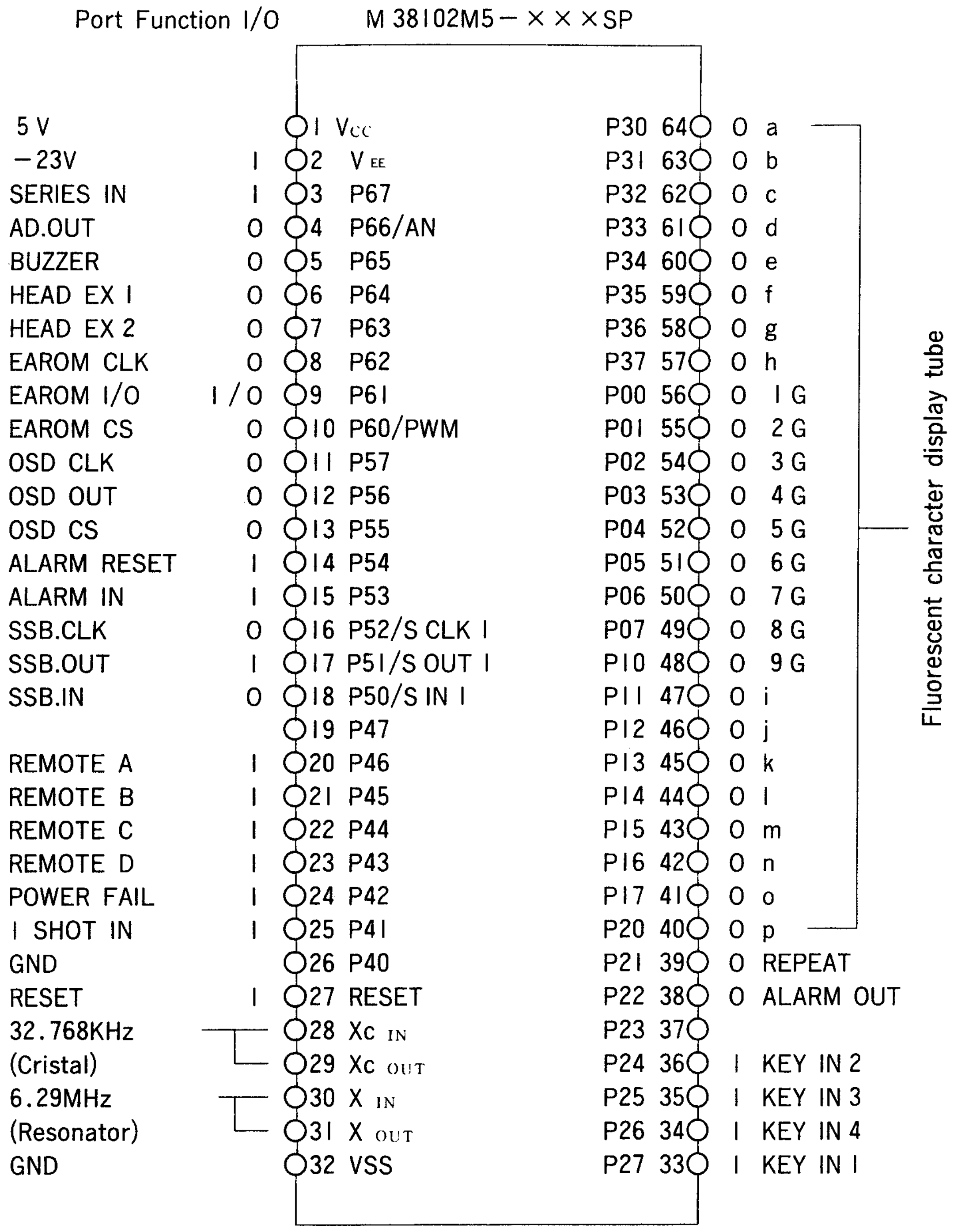

TM-1 BOARD
A7001
FLUORESCENT DISPLAY
HEATER+
HEATER−
IC701
TIMER MPU
16
17
18
SERIAL TRANSFER
SY-A
SSB CLK
SSB OUT
SSB IN
GRID OUTPUT
48~56
SEGMENT AND K.SCAN OUTPUT
40~47,57~64
SERIAL TRANSFER
11~13
VD-A
CHARACTER GENERATOR
SI
SCLK
CS
VOB
VOC
HD
VD
BLANK
CO
HD
VD
KEY MATRIX
K.SCAN RETURN
33~36
KEY MATRIX
TB-1
15
38
6
7
ALARM 0
ALARM 1
HEAD EX 0
HEAD EX 1
30
31
X7001 6MHz MAIN OSC
28
29
X7002 32.8KHz SUB OSC
20~23
12 TO 4 ENCODER
REMOTE CONTROL DECODER
REMOTE
RESET
27
ALWAYS 12V
ALWAYS 12V
PICTURE CONTROL
TM-2 BOARD
RESET
IC702
3 2 1
PICTURE CON.VR
TRACKING
HEATER +
HEATER −
ALWAYS-23
ALWAYS 5.6V
ALWAYS 12V
SWD 12
TM-A BOARD
PW-1

Fig. 7−1 Block diagram of timer circuit



Port Function I/O — M 38102M5－×××SP

Port Function	I/O	Pin	Port	Port	Pin	I/O	Function
5 V		1	V_{CC}	P30	64	O	a
－23V	I	2	V_{EE}	P31	63	O	b
SERIES IN	I	3	P67	P32	62	O	c
AD.OUT	O	4	P66/AN	P33	61	O	d
BUZZER	O	5	P65	P34	60	O	e
HEAD EX 1	O	6	P64	P35	59	O	f
HEAD EX 2	O	7	P63	P36	58	O	g
EAROM CLK	O	8	P62	P37	57	O	h
EAROM I/O	I/O	9	P61	P00	56	O	1 G
EAROM CS	O	10	P60/PWM	P01	55	O	2 G
OSD CLK	O	11	P57	P02	54	O	3 G
OSD OUT	O	12	P56	P03	53	O	4 G
OSD CS	O	13	P55	P04	52	O	5 G
ALARM RESET	I	14	P54	P05	51	O	6 G
ALARM IN	I	15	P53	P06	50	O	7 G
SSB.CLK	O	16	P52/S CLK 1	P07	49	O	8 G
SSB.OUT	I	17	P51/S OUT 1	P10	48	O	9 G
SSB.IN	O	18	P50/S IN 1	P11	47	O	i
		19	P47	P12	46	O	j
REMOTE A	I	20	P46	P13	45	O	k
REMOTE B	I	21	P45	P14	44	O	l
REMOTE C	I	22	P44	P15	43	O	m
REMOTE D	I	23	P43	P16	42	O	n
POWER FAIL	I	24	P42	P17	41	O	o
1 SHOT IN	I	25	P41	P20	40	O	p
GND		26	P40	P21	39	O	REPEAT
RESET	I	27	RESET	P22	38	O	ALARM OUT
32.768KHz		28	$X_{c\,IN}$	P23	37		
(Cristal)		29	$X_{c\,OUT}$	P24	36	I	KEY IN 2
6.29MHz		30	X_{IN}	P25	35	I	KEY IN 3
(Resonator)		31	X_{OUT}	P26	34	I	KEY IN 4
GND		32	VSS	P27	33	I	KEY IN 1

Fluorescent character display tube

Fig. 7−2 Port allocation

Table 7 – 1 I/O chart

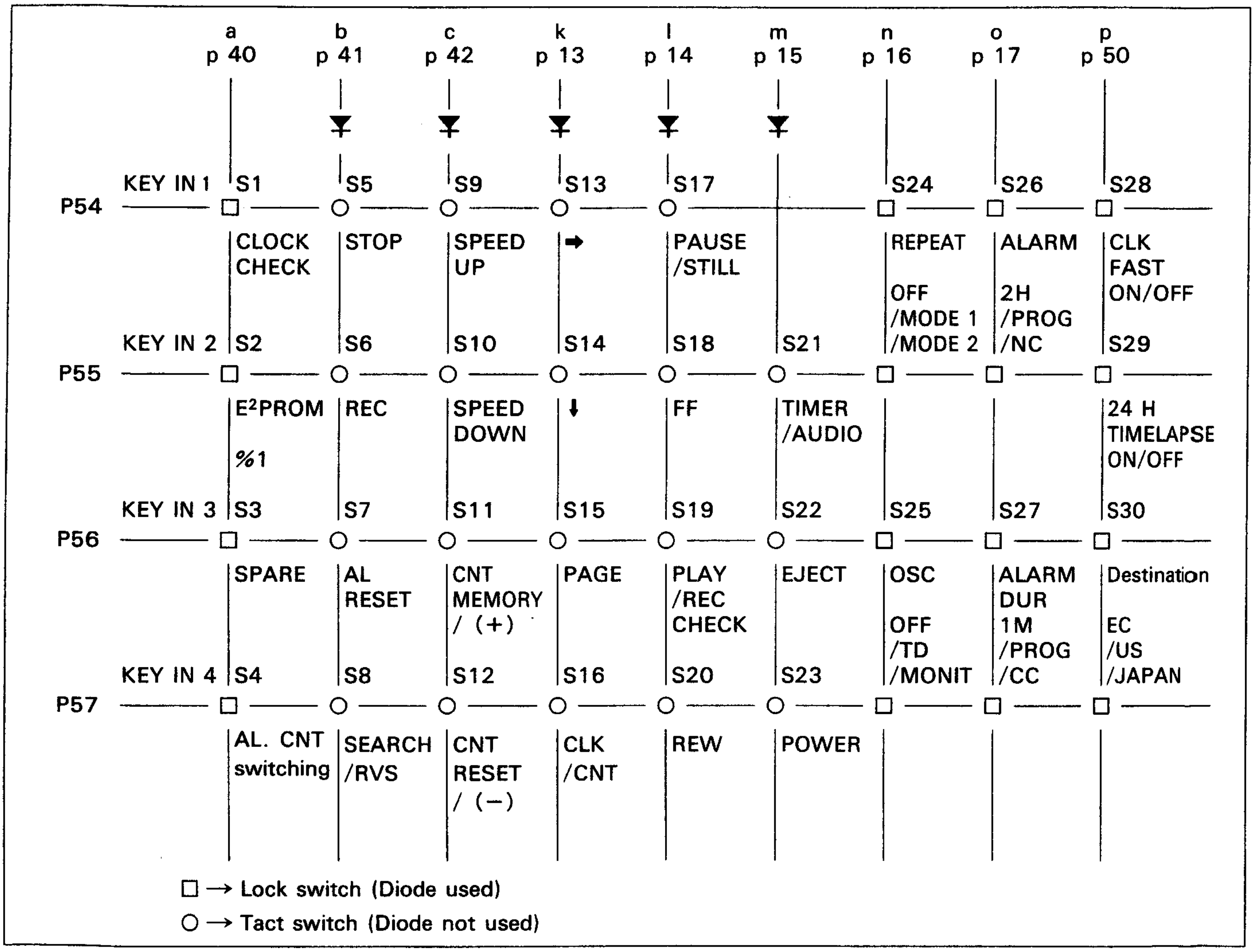
PIN	PORT	Signal	Description	ACTIV	I/O
1	Vcc	Vcc	5 V		
2	V_{EE}	V_{EE}	−23V	H	I
3	P67	SERIES IN	Series recording signal input	H	I
4	P66	AD. OUT		H	O
5	P65	BUZZER		H	O
6	P64	HEAD EX 1		H	O
7	P63	HEAD EX 2		H	O
8	P62	E^{2}PROM CLK	Clock output to E^{2}PROM	L	O
9	P61	E^{2}PROM I/O	Data input/output to E^{2}PROM	L	I/O
10	P60	E^{2}PROM CS	CS output to E^{2}PROM	L	O
11	P57	OSD CLK	Clock output to OSD	L	O
12	P56	OSD OUT	Data output to OSD	L	O
13	P55	OSD CS	CS output to OSD	L	O
14	P54	ALARM RESET		H	I
15	P53	ALARM IN		H	I
16	P52	SSB S.CLK	SSB CLK input	H	I
17	P51	SSB S.OUT	SSB DATA output	L	O
18	P50	SSB S. IN	SSB DATA input	L	I
19	P47	SSB S. IN	SSB DATA input	L	I
20	P46	REMOTE A		L	I
21	P45	REMOTE B		L	I
22	P44	REMOTE C		L	I
23	P43	REMOTE D		L	I
24	P42	POWER FAIL	Power failure detection	L	I
25	P41	1 SHOT IN	1-SHOT recording signal input	L	I
26	P40	–	GND		
27	RST	RESET	Reset input	L	I
28	Xc_{IN}	Xc_{IN}	6.29MHz		
29	Xc_{OUT}	Xc_{OUT}			
30	X_{IN}	X_{IN}	32.768MHz		
31	X_{OUT}	X_{OUT}			
32	Vss	Xss	GND		
33	P27	KEY IN	KEY SCAN input	H	I
34 ~ 36	P26 ~ P24				
37	P23	–	–		
38	P22	ALARM OUT	ALARM OUT		
39	P21	REPEAT	REPEAT OUT	H	O
40	P20	p SEG ~ i SEG	SEGMENT/KEY SCAN output	H	O
41 ~ 47	P17 ~ P11				O
48	P10	1~9 GRID	GRID output	H	O
49 ~ 56	P07 ~ P00				
57 ~ 64	P37 ~ P30	a SEG ~ h SEG	SEGMENT/KEY SCAN output	H	O

7–2–2. Key input

When the pulse shown in Fig. 7–4 is output from a-p to the key matrix shown in Fig. 7–3, of the KEY SW is turned on, the output is taken in by KEY IN 1-4. In this case, it is recognized which switch is turned on by the timing of a-p and the signal coming into KEY IN 1-4.

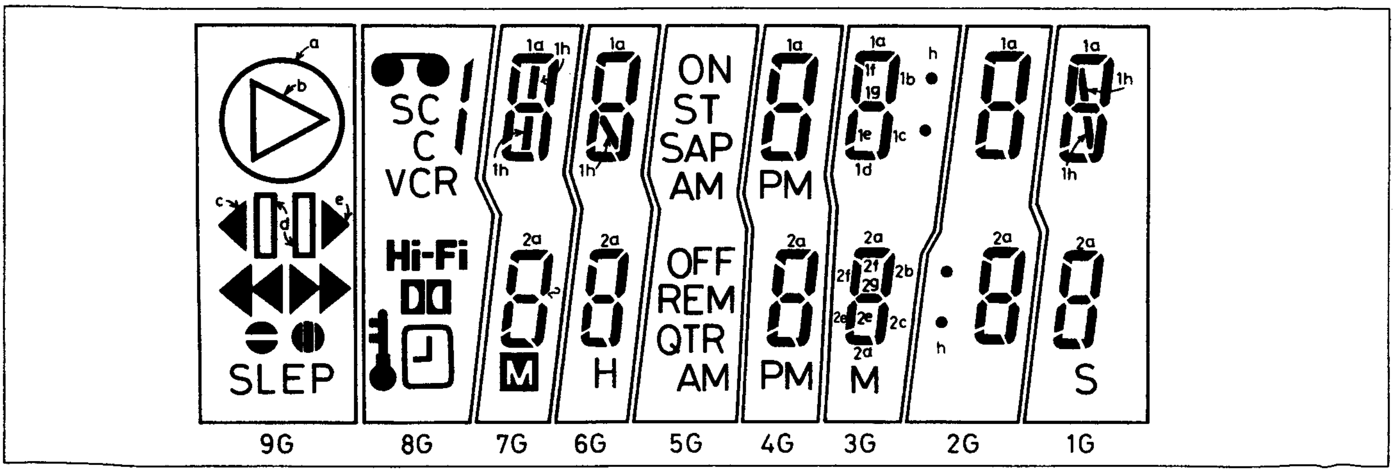
For example, if input is accepted in KEY IN 1 in Fig. 7–4, the pulse of a goes into KEY IN 1 and it is regarded that the SW at which a and KEY IN 1cross each other is turned on.

Therefore, it is regarded that "STOP" is pressed.



a p 40
b p 41
c p 42
k p 13
l p 14
m p 15
n p 16
o p 17
p p 50
KEY IN 1
P54
S1
S5
S9
S13
S17
S24
S26
S28
CLOCK CHECK
STOP
SPEED UP
➡
PAUSE /STILL
REPEAT OFF /MODE 1 /MODE 2
ALARM 2H /PROG /NC
CLK FAST ON/OFF
KEY IN 2
P55
S2
S6
S10
S14
S18
S21
S29
E²PROM %1
REC
SPEED DOWN
⬇
FF
TIMER /AUDIO
24 H TIMELAPSE ON/OFF
KEY IN 3
P56
S3
S7
S11
S15
S19
S22
S25
S27
S30
SPARE
AL RESET
CNT MEMORY / (+)
PAGE
PLAY /REC CHECK
EJECT
OSC OFF /TD /MONIT
ALARM DUR 1M /PROG /CC
Destination EC /US /JAPAN
KEY IN 4
P57
S4
S8
S12
S16
S20
S23
AL. CNT switching
SEARCH /RVS
CNT RESET / (−)
CLK /CNT
REW
POWER
□ → Lock switch (Diode used)
○ → Tact switch (Diode not used)

Fig. 7–3 KEY MATRIX



a
b
c
d
e
SLEP
SC
C
VCR
Hi-Fi
1a
1h
1a
1h
1h
ON
ST
SAP
AM
1a
PM
1a
1f
1g
1b
1e
1c
1d
h
1a
1a
1h
1h
2a
M
2a
H
OFF
REM
QTR
AM
2a
PM
2a
2f
2g
2b
2e
2c
2d
M
h
2a
2a
S
9G
8G
7G
6G
5G
4G
3G
2G
1G

Fig. 7–5 Display of FLT

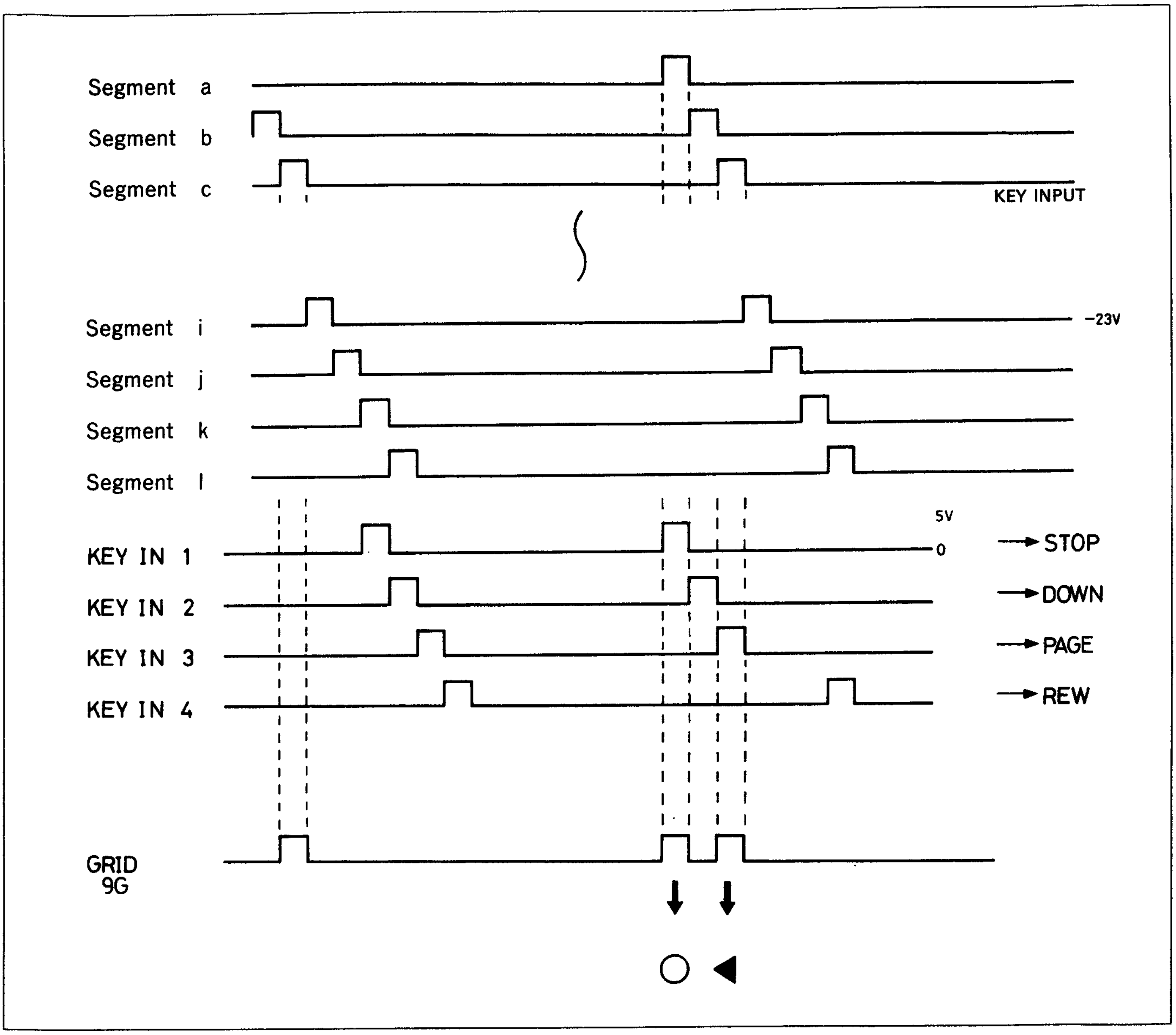

Segment a
Segment b
Segment c
KEY INPUT
Segment i
Segment j
Segment k
Segment l
-23V
5V
0
KEY IN 1
KEY IN 2
KEY IN 3
KEY IN 4
STOP
DOWN
PAGE
REW
GRID
9G

Fig. 7-4 Recognition of key input

7−2−3. Drive of FLT

Lighting of FLT is performed by dynamic lighting method and when both GRID and SEGMENT are HIGH, the crossing point is lit up.
FLT display is shown in Fig. 7−5 and connection of grid and segment is shown in Table 7−2.
Example of FLT ON. When the GRID 9G in Fig. 7−4 becomes high at the pulse position of "a" and "c", the display at the crossing points of the GRID 9G and a, c which are "○" and "◀" are turned on.

Segment ↓ / Grid →	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	○	●●	1a	1a	ON	1a	1a	1a	1a
b	▷	SC	1b	1b	ST	1b	1b	1b	1b
c	◀	/	1c	1c	SAP	1c	1c	1c	1c
d	▯▯	C	1d	1d	AM	1d	1d	1d	1d
e	▶	VCR	1e	1e		1e	1e	1e	1e
f			1f	1f		1f	1f	1f	1f
g			1g	1g		1g	1g	1g	1g
h			1h	1h		PM	:	:	1h
i	◀◀	DD	2a	2a	OFF	2a	2a	2a	2a
j	▶▶	Hi-Fi	2b	2b	REM	2b	2b	2b	2b
k	⊖	🌡	2c	2c	QTR	2c	2c	2c	2c
l	◐	⏲	2d	2d	AM	2d	2d	2d	2d
m	S		2e	2e		2e	2e	2e	2e
n	L		2f	2f		2f	2f	2f	2f
o	E		2g	2g		2g	2g	2g	2g
p	P		M	H		PM	M		S

Table 7−2 Grid · Segment connection table

7−2−4. Character generator circuit

For ON screen function of this system, MPU sends character production code to the character generator, the character generator generates characters and the characters are inserted in the video circuit.
IC used for the character generator is M50556. Fig. 7−6 shows the location of the terminals, Table 7−3 shows the I/O terminals and the function and Fig. 7−8 shows the block diagram.

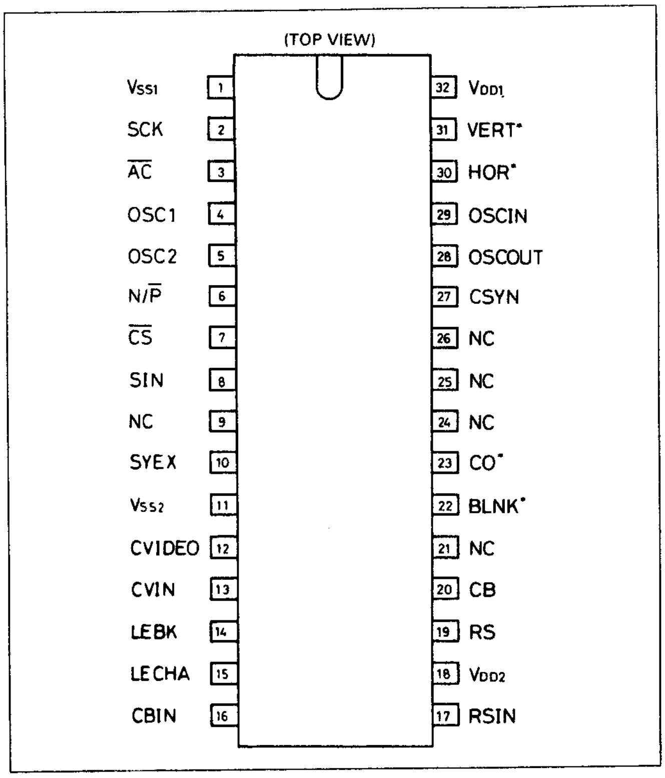

(TOP VIEW)
Vss1 1
SCK 2
AC 3
OSC1 4
OSC2 5
N/P 6
CS 7
SIN 8
NC 9
SYEX 10
Vss2 11
CVIDEO 12
CVIN 13
LEBK 14
LECHA 15
CBIN 16
32 VDD1
31 VERT*
30 HOR*
29 OSCIN
28 OSCOUT
27 CSYN
26 NC
25 NC
24 NC
23 CO*
22 BLNK*
21 NC
20 CB
19 RS
18 VDD2
17 RSIN

Fig. 7−6 M50556 Layout of terminals

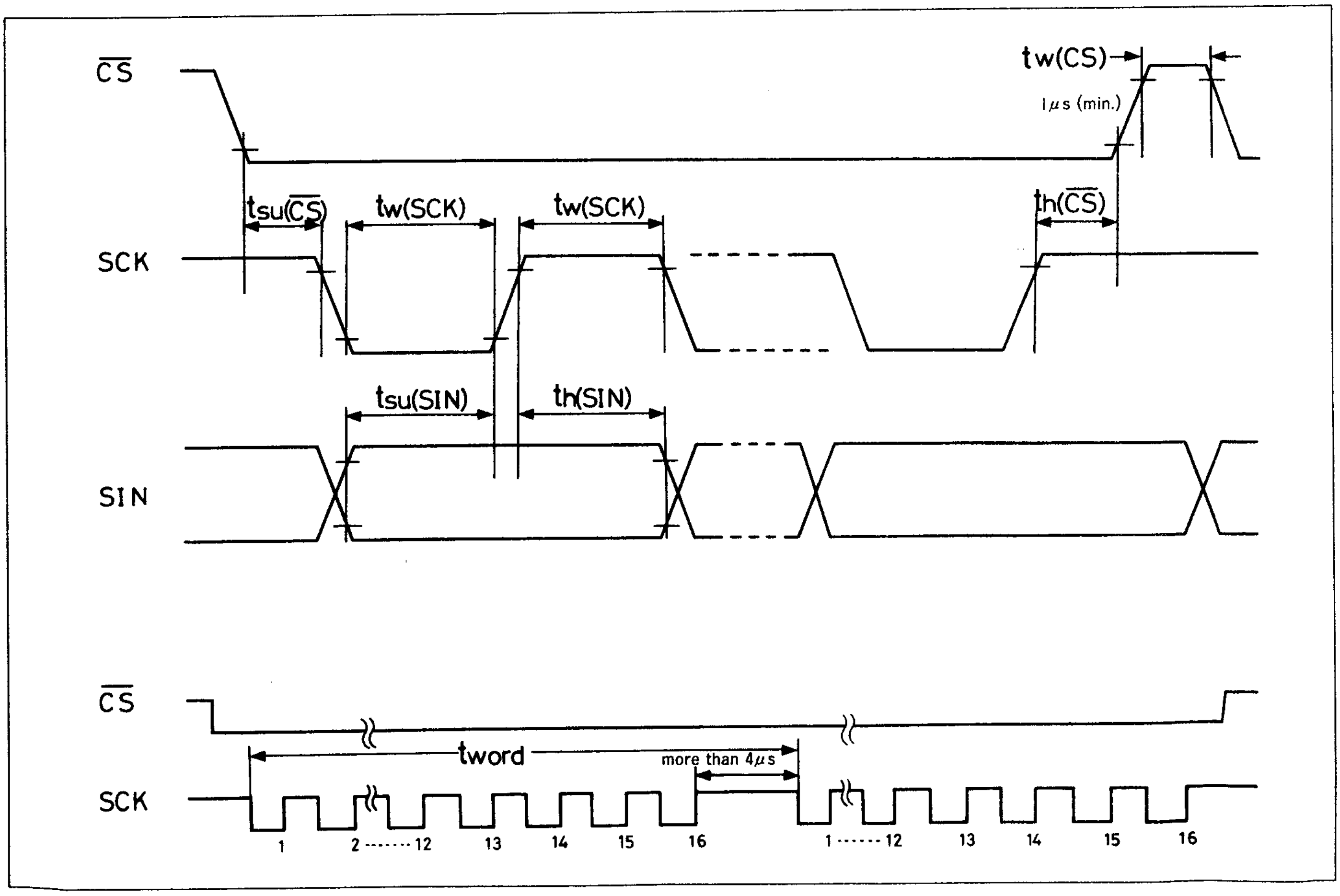
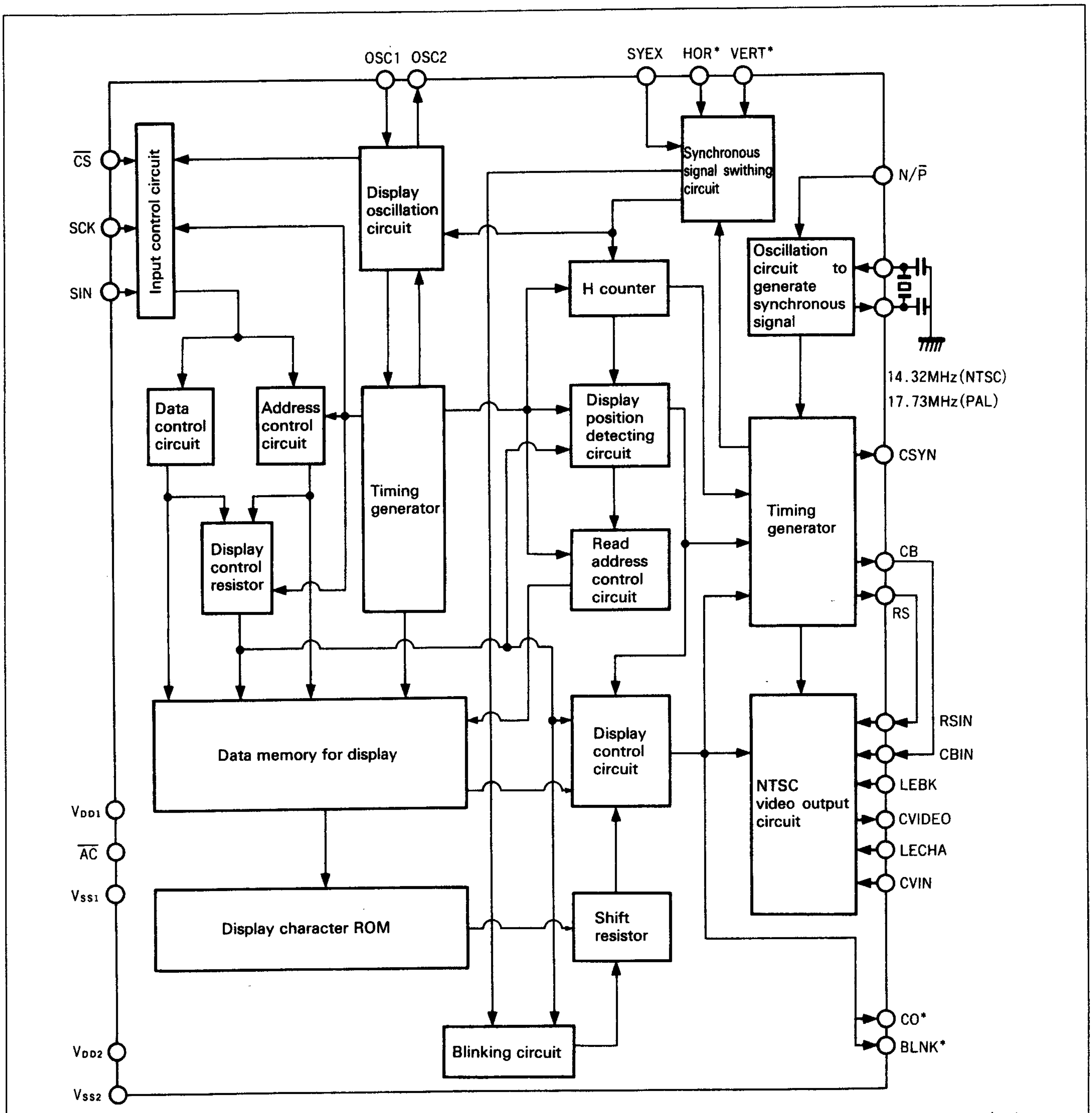

CS
SCK
SIN
tw(CS)
1μs (min.)
tsu(CS)
tw(SCK)
tw(SCK)
th(CS)
tsu(SIN)
th(SIN)
CS
SCK
tword
more than 4μs
1
2 ······· 12
13
14
15
16
1 ······ 12
13
14
15
16

Fig. 7−7 Timing of serial transfer

Table 7-3 I/O terminals and the function

Pin No.	Mark.	Terminal	Description
1	Vss 1	Ground terminal	Digital ground terminal. Connect to GND.
2	SCK	Serial clock input	SIN serial data is put in upon rise of SCK when CS terminal is "L". Hysterisis input. Built-in pull-up resistor.
3	$\overline{\text{AC}}$	Auto-clear input	IC internal circuit is reset at "L". Built-in pull-up resistor. Hysterisis input.
4 5	OSC 1 OSC 2	External terminal for oscillation circuit	External terminal for display oscillation circuit. Standard oscillation frequency is 7 MHz approximately. This oscillation frequency decides the display position of horizontal TV screen and the width of character.
6	N/$\overline{\text{P}}$	NTSC/PAL switching input	Synchronous signal switching terminal for NTSC or PAL. NTSC synchronous signal is given at "H", and PAL synchronous signal is given at "L". Built-in pull-up resistor.
7	$\overline{\text{CS}}$	Chip select input	Chip select terminal. Serial data is transmitted at "L". Built-in pull-up resistor.
8	SIN	Serial data input	Data and address of display control resistor and display data memory is input in serial. Built-in pull-up resistor.
9	NC		Not-connected terminal
10	SYEX	Synchronous signal switching input	Switching terminal for external synchronous signal or internal synchronous signal. The mode is external synchronous signal at "H" and the internal synchronous signal at "L". Together with Address 243 EX resistor in display control resistor SYEX makes OR in which internal synchronous signal has the precedence. Built-in pull-up resistor.
11	Vss 2	Ground Terminal	Analog ground terminal. Connect to GND.
12	CVIDEO	Composite video output	Output terminal for composite video signal. 2Vp-p composite video signal is output. Character output and others are superimposed on CVIN signal to be output.
13	CVIN	Composite video input	Input terminal for composite video signal. Character output and others are superimposed on this CVIN signal to be output.
14	LEBK	Blanking level input	Input terminal to decide the blanking level of video signal.
15	LACHA	Character level input	Input terminal to decide the character output level in video signal. Character color is white.
16	CBIN	Color burst signal input	Color burst output is converted to color burst signal level in video signal in the external circuit to be input.
17	RSIN	Character background carrier chrominance signal input	RS output is converted to the color burst signal level of video signal in the external circuit to be input.
18	V_{DD} 2	Power supply terminal	Analog power supply terminal.Connect to +5V.
19	RS	Character background carrier chrominance signal output	Carrier chrominance signal output to color the background of character. This outputs the signal which has a phase angle with the color burst signal CB. Amplitude : 5V.
20	CB	Clolr burst signal output	Clolr burst signal is output, 3.58MHz in NTSC, 4.43MHz in PAL. Amplitude : 5V.
21	NC		Not-connected terminal.
22	BLNK*	Character background output	Character background signal is output. Polarity can be selected when character ROM is decided.
23	CO*	Character output	Character signal is output. Polarity can be selected when character ROM is decided.
24	NC		Not-connected terminal.
25	NC		Not-connected terminal.
26	NC		Not-connected terminal.
27	CSYN	Composite synchronous signal output	Composite synchronous signal in NTSC or PAL is output. Polarity : Negative Amplitude : 5V.

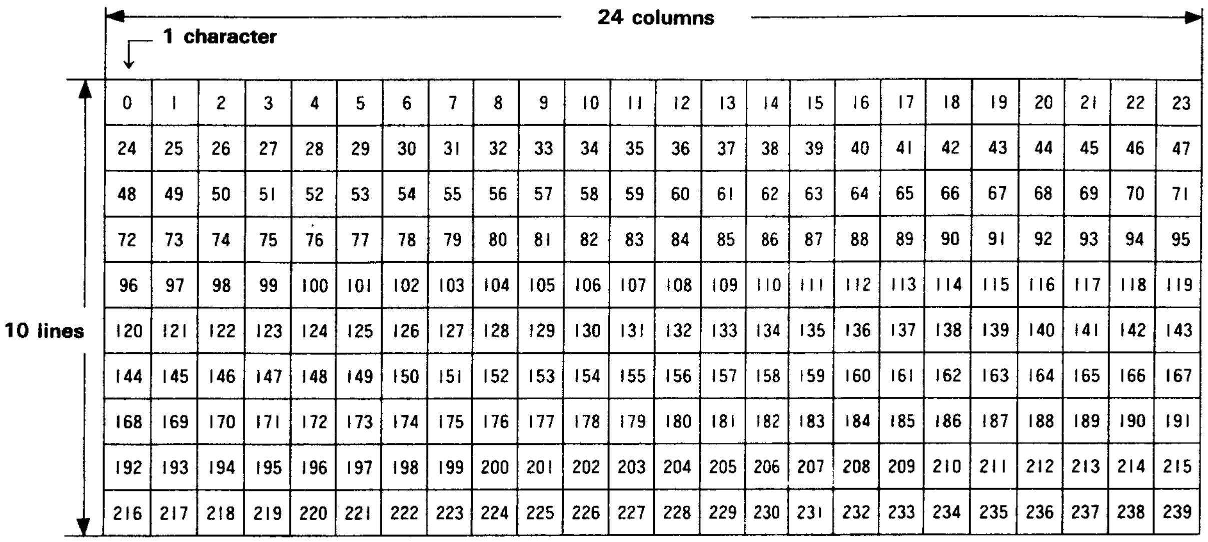
Pin No.	Mark.	Terminal	Description
28 29	OSCOUT OSCIN	Oscillation circuit to generate synchronous signal	External terminal for oscillation circuit to generate synchronous signal. Oscillation frequency : 14.32MHz in NTSC, 17.73 MHz in PAL.
30	HOR*	Horizontal synchronous signal	Horizontal synchronous signal is input. Hysterisis input. Polarity can be selected when character ROM is decided.
31	VERT*	Vertical synchronous signal	Vertical synchronous signal is input. Hysterisis input. Polarity can be selected when character ROM is decided.
32	VDD	Power supply terminal	Digital power supply. Connect to +5V.


OSC1
OSC2
SYEX
HOR*
VERT*
CS
SCK
SIN
Input control circuit
Display oscillation circuit
Synchronous signal swithing circuit
N/P
H counter
Oscillation circuit to generate synchronous signal
14.32MHz(NTSC)
17.73MHz(PAL)
Data control circuit
Address control circuit
Timing generator
Display position detecting circuit
CSYN
Timing generator
Display control resistor
Read address control circuit
CB
RS
RSIN
CBIN
LEBK
CVIDEO
LECHA
CVIN
Data memory for display
Display control circuit
NTSC video output circuit
VDD1
AC
VSS1
Display character ROM
Shift resistor
Blinking circuit
CO*
BLNK*
VDD2
VSS2

Note : Input or output polarity can be selected when the font is decided for those marked*.

Fig. 7-8 M50556 block diagram

Fig. 7−9 shows the configuration of the display screen. M50556 can display the total of 240 characters in 24 columns x 10 lines. There is no space between a character and a character and all the characters are continuous.


24 columns
1 character
10 lines

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167
168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215
216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239

Fig. 7−9 Configuration of display screen

Each character is made up of 12 × 18 dot matrix. (Fig. 7−10)

Fig. 7−11 shows the move of characters (with keys). Characters can be moved by changing the position for starting vertical display and the position for starting horizontal display.

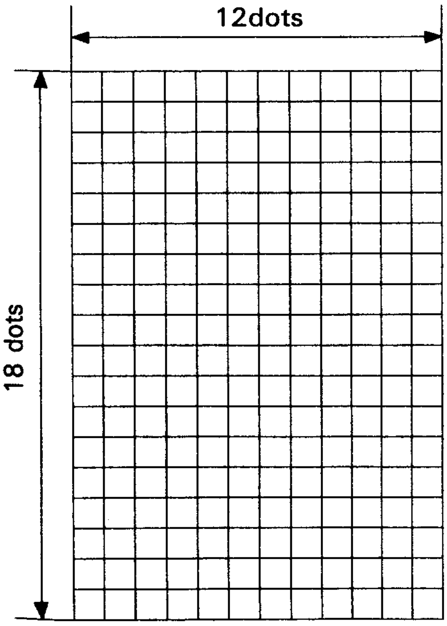

12dots
18 dots

Fig. 7−10 Configuration of one character

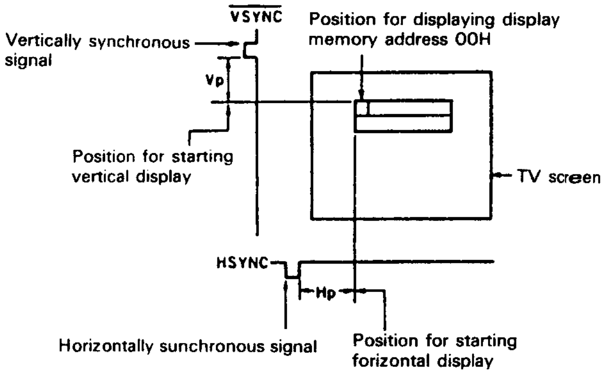

VSYNC
Vertically synchronous signal
Position for displaying display memory address 00H
Vp
Position for starting vertical display
TV screen
HSYNC
Hp
Horizontally sunchronous signal
Position for starting forizontal display

Fig. 7−11 Position for starting horizontal/vertical display

Data transfer

Write of display control command and data is performed by 16-bit serial transfer.

Set $\overline{CS}$ terminal to low level when performing the serial transfer. When $\overline{CS}$ terminal is at low level, any data of each command, first byte, second byte,……nth byte can be transferred.

Data is 16-bit long. Input data to S IN terminal from LSB (lowest rank bit) by shifting in due order. As shown in Fig. 7−7, data is taken in and shifted when the shift clock input to SCLK terminal is set up. When the 16 th bit shift clock is set up, the transferred data is latched inside.

(Note)

In the serial transfer, received No. of bits is counted by the shift clock counting. When $\overline{CS}$ terminal is set to low level from high level, this serial transfer is reset and 16-bit data afterwards (16 times of shift clock) is regarded as byte data. Because of this, byte synchronization can be performed by using $\overline{CS}$ terminal.

When serial transfer is performed continuously, the suceeding data cannot be transferred before the previous data is latched immediately after 16-bit transfer (time shown with A in Fig. 7−7 : Less than 1 us).

When reset is input, command 0 (memory for display preset) is selected and A7 (A7 of display memory address) becomes "0".

(Note) During byte transfer (to be initialized by CS), if MSB (bit 7) of the received data is 1, it is ragarded as the 1st byte (command) and the reset are regarded as data.

Rewriting of the screen

When MENU and program screen of the screen display is once written to display RAM, the same characters are rewritten on the previous writing in a slow cycle.

On the other hand, in time display mode, characters are rewritten every 1 sec. Blank is written on the unused display screen and appearance of characters due to operation error is prevented.

RESET of the character generator

Character generator is reset by a charge time of C7407 with power turned ON.

7−2−5. System control interface

Because key input for system control operation is performed, key input data is serially transferred.

Also in case of power failure, back-up information and fluorescent display tube ON information are serially transferred.

Besides the above, information to be used for counters is communicated.

(SSB, DATA, IN/OUT, CLOCK)

More details are described in the section of system control.

7−2−6. Alarm recording function

When low input lasts for more than 20 msec, input of alarm detection is recognized. Fig. 7−12 (a).

There are two ways of alarm recording with two time modes: 1M/PROG mode and cc. mode. (Either can be selected with Alarm Duration SW.)

(1) 1M/PROG mode (set ALARM DURATION SW at 1/PROG)

Recording is performed for 1M/PROG after alarm detection. Alarm input is not accepted during recording. Fig. 7−12 (b) (c).

When the input is low for more than the set duration, recording is performed only for the first 1M/PROG duration. Fig. 7−12 (d), (e).

(2) CC Mode (set ALARM DURATION SW at CC)

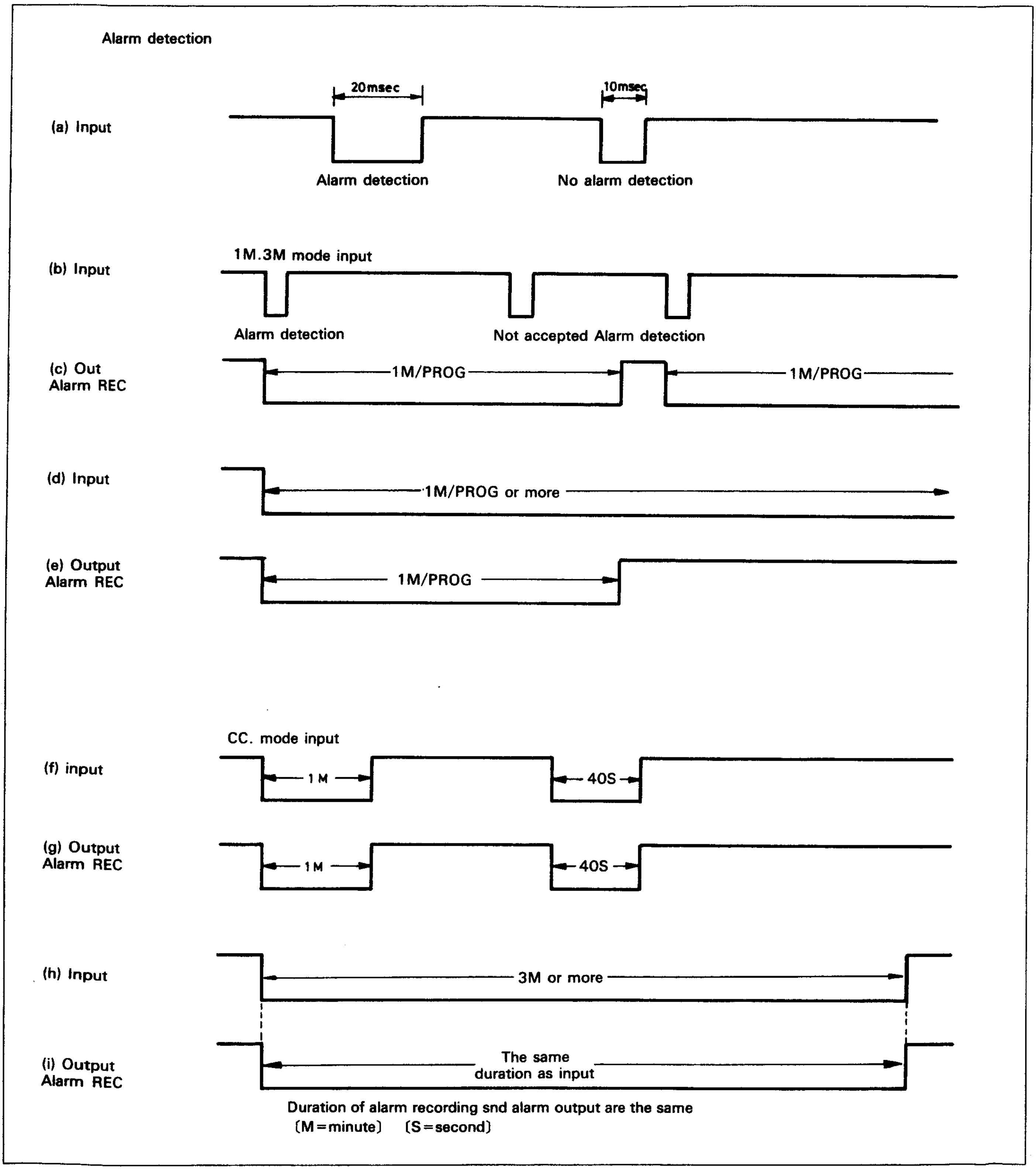
Recording is performed so long as alarm is detectet from he first alarm detection. If alarm detection is shorter than 1M/PROG, recording is finished there. Fig. 7−12 (f), (g)

When alarm detecting duration is longer than PROG, recording is performed for the same duration as the input duration. Fig. 7−12 (h), (i)

When alarm detection is shorter than 5sec, recording time shall be different depending on the state, whether is is from STOP condition or from REC condition.

From STOP condition, recording shall be performed for the total of 5sec.

From REC condition, recording shall be performed only during the alarm detection.


Alarm detection
(a) Input
20msec
10msec
Alarm detection
No alarm detection
(b) Input
1M.3M mode input
Alarm detection
Not accepted Alarm detection
(c) Out
Alarm REC
1M/PROG
1M/PROG
(d) Input
1M/PROG or more
(e) Output
Alarm REC
1M/PROG
(f) input
CC. mode input
1 M
40S
(g) Output
Alarm REC
1 M
40S
(h) Input
3M or more
(i) Output
Alarm REC
The same
duration as input

Duration of alarm recording snd alarm output are the same
(M=minute) (S=second)

Fig. 7-12 Alarm REC timing.

7–2–8. Head selecting function

By the key input, port output for head change and change display are made.

Table 7–4 Head selection by key

Key input	Port output		FLT display	Head selection
	HEAD EX_0	HEAD EX_1		
During PLAY "REC" + "+"	0	1	+	MAIN(−), SUB(−)
During PLAY "REC" + "−"	1	1	−	MAIN(+), SUB(−)
During PLAY "REC" + "UP"	1	0	SC	SUB(+), SUB(−)
During PLAY "REC" + "DOWN"	0	0	None	MAIN(+), MAIN(−)

Table 7–4 shows key input, port output, FLT display and head selection. Fig. 7–13 shows the configuration of the heads.

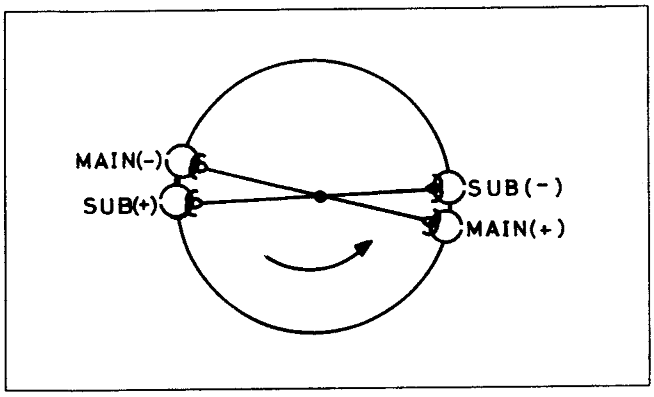


Fig. 7–13 Configuration of heads

7–2–9. Memory back-up function

For memory back-up function, MPU detects power failure with voltage from power failure detecting circuit, stop port output, changes clock from MAIN to SUB, minimizes the power consumption by MPU and has power supplied from consumption by MPU and has power supplied from racharged back-up circuit to back-up memory capacity and continue clock operation.

The following shows the operation of each circuit.

1) Power failure detecting circuit.
   RESET signal from the system control circuit is used for detecting power failure. For detecting power failure, low input is necessary for min. 30 msec.
2) MPU's power failure operation
   When MPU detects power failure, it normally makes port output high and port output for FLT low in order to minimize the current running. At the same time, it memorized the status of the output ports and serial output to the system control in the memory.
   It then stops the clock (MAIN OSC 6.2 MHz) and switches to sub OSC 32.768KHz to decrease power consumption.
   When power failure is reset, it switches on the MAIN OSC from SUB OSC and resets each port output to the previous status.
3) Back-up circuit
   The following capacity Ni-Cad battery is used for back-up purpose.
   Nominal voltage : 3.6V
   Nominal capacity : 90mAh
   Trickle recharging current : 3.3mA
   Trickle recharging time : 48Hr or more
   Recharging is performed through R1999 and the recharging current is the range of 1.5-4.5mA, which goes down as the battery is recharged. Discharge is also performed through R7503. However, as the impedance of the power source after the power failure operation is high (20k-50 kΩ), voltage drop due to R1999 is small.D7503 is a bypass circuit in order to prevent the temporary voltage drop from the start of power failure till MPU is in the power failure mode.
   Fig. 7–14 shows the discharge characteristic. It seems that this circuit is almost subject to this characteristic.
4) Reset circuit
   For resetting the timer MPU, the reset IC MN1380L is used.
   There are two ways to reset.
   ① Forced RESET
   By pressing the RESET key, input of IC702 becomes low, which outputs the reset pulse.
   ② Auto RESET
   In case of power failure, back-up voltage goes dow to less than 3.1V. 5V is applied to VDD RESET is automatically performed.
   Fig. 7–15 shows the reset voltage and VDD timing in this case.
   ③ **RESET when cabinet is removed**
   When the cabinet is opened for repair, be sure to pull out the socket CN721 and separate Ni-Cad battery from the circuit. Do not short Ni-Cad battery. (The performance shall be deteriorated.) When attaching the cabinet, insert CN721, turn on the power supply and reset the timer microcomputer.

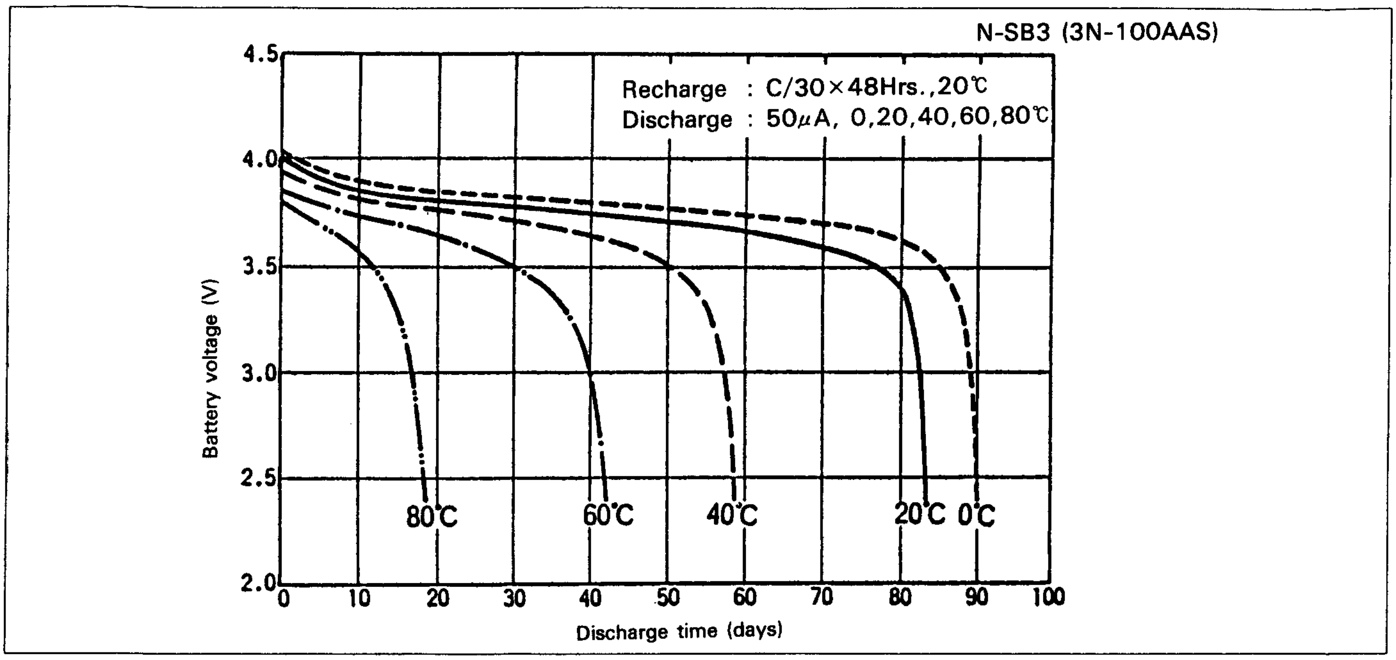


Fig. 7-14 Discharge characteristic

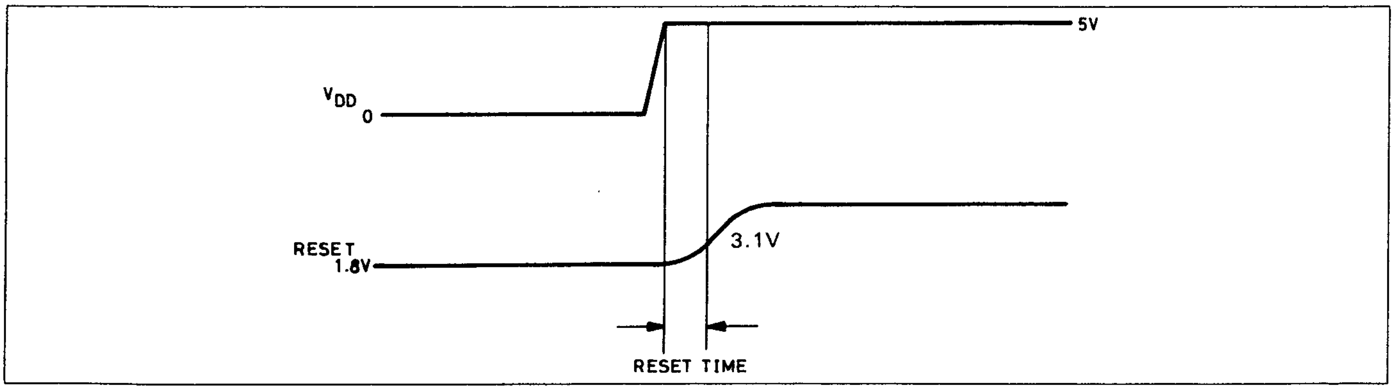

5V
VDD
0
RESET
1.8V
3.1V
RESET TIME

Fig. 7-21 Reset timing

7-2-10. DEW (condensation) reset timer recoding

This is the function to execute recording for the timer recording duration after condensation is reset when DEW is on while standing by for the timer recording. (①and ②in Fig. 7-16)

However, recording is not continued after condensation is reset when condensation is on during the normal recording is stopped, it can be judged that the stop is due to DEW. While condensation is on, "dd dd" indicator blinks.

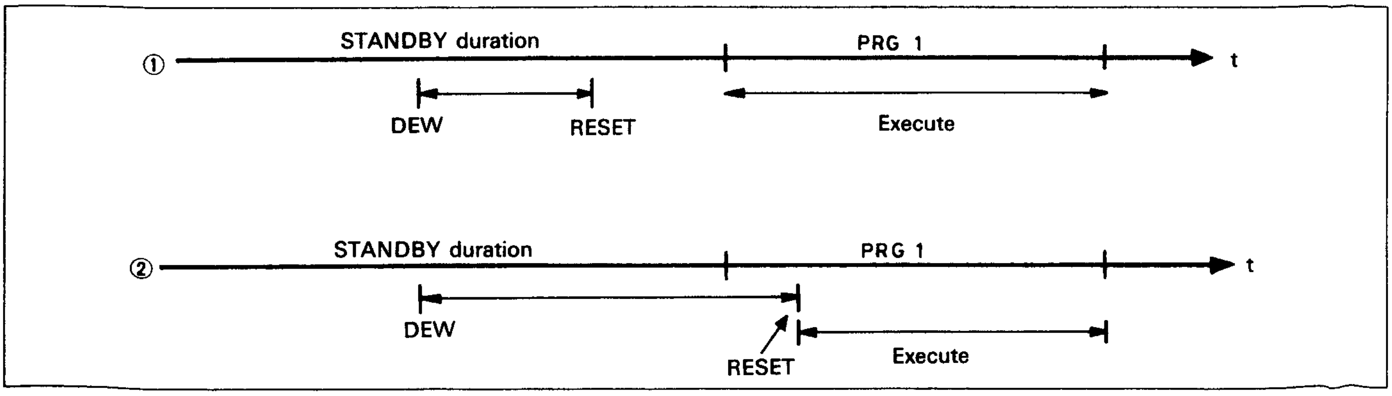

①
STANDBY duration
PRG 1
t
DEW
RESET
Execute
②
STANDBY duration
PRG 1
t
DEW
RESET
Execute

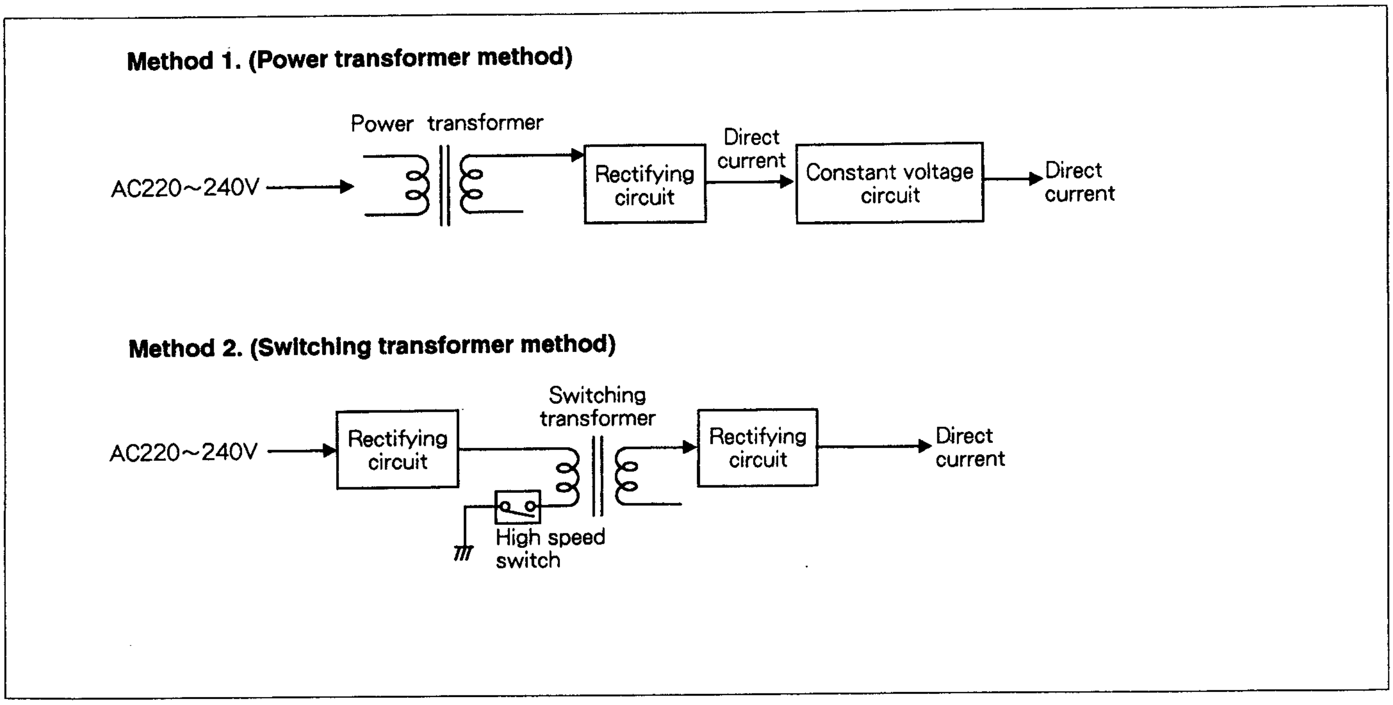
Fig. 7-22 Example of DEW reset timer recording Execute

8. POWER SUPPLY CIRCUIT

8-1. Introduction

A power supply circuit is the circuit to convert an electric energy and supply it for other circuits, that is, the circuit to convert AC 220~240, 50Hz to the stabilized DC voltage required by microcomputers or motors.

There are two major ways to have stabilized DC voltage : One is to transform AC voltage to low (high) voltage using a power transformer and rectify it, and then to stabilize it by a constant voltage circuit (series power supply, chopper switching power supply). Another is an off line switching power supply ; to rectify AC 220~240 to DC, artificially switch at high speed to input into a switching (high frequency) transformer, transform it to low (high) voltage by the switching transformer, and then rectify it to have direct current.



Method 1. (Power transformer method)

AC220~240V
Power transformer
Rectifying circuit
Direct current
Constant voltage circuit
Direct current

Method 2. (Switching transformer method)

AC220~240V
Rectifying circuit
Switching transformer
High speed switch
Rectifying circuit
Direct current

Fig. 8-1.

	Power transformer method	Switching transformer method
Merits	Small number of parts. Little noise.	High efficiency and low calorific value. Small size and light.
Demerits	Low efficiency and high calorific value. Large and heavy parts.	Large number of parts. Much noise.

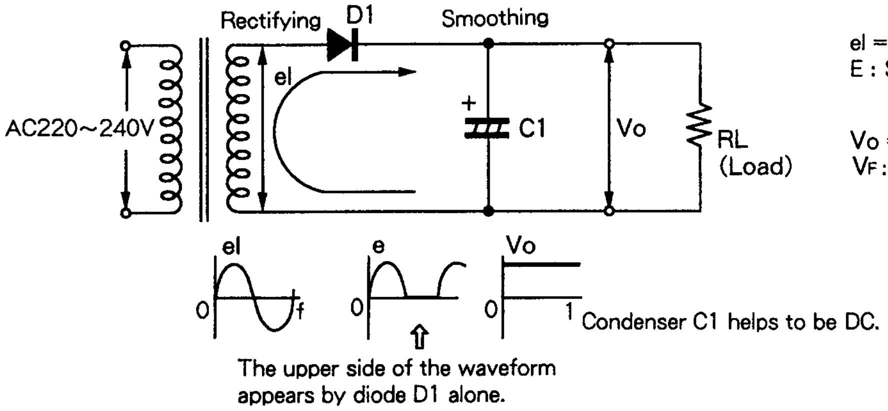
Table 8-1. Merits and demerits of each method

8−2. Rectifying circuit

This is the circuit to convert AC to DC using a diode. There are half-wave rectification, full-wave rectification, bridge rectification, etc.

8−2−1. Half-wave rectifying circuit

The following figure is the half-wave rectifying circuit, which uses a diode. This model has the circuit in the secondary rectifying circuit.


Rectifying
D1
Smoothing
AC220~240V
el
+
C1
Vo
RL
(Load)
el
e
Vo
0
f
0
0
1

Condenser C1 helps to be DC.

The upper side of the waveform appears by diode D1 alone.

$el = \sqrt{2}E \sin wt$
E : Secondary output AC effective value

$V_O = \sqrt{2}E - V_F$
V_F : Diode D1 forward voltage

Fig. 8−2. Half-wave rectifying circuit

8-2-2. Bridge rectifying circuit

The bridge rectifying circuit has four diodes as shown in Fig. 8-3.

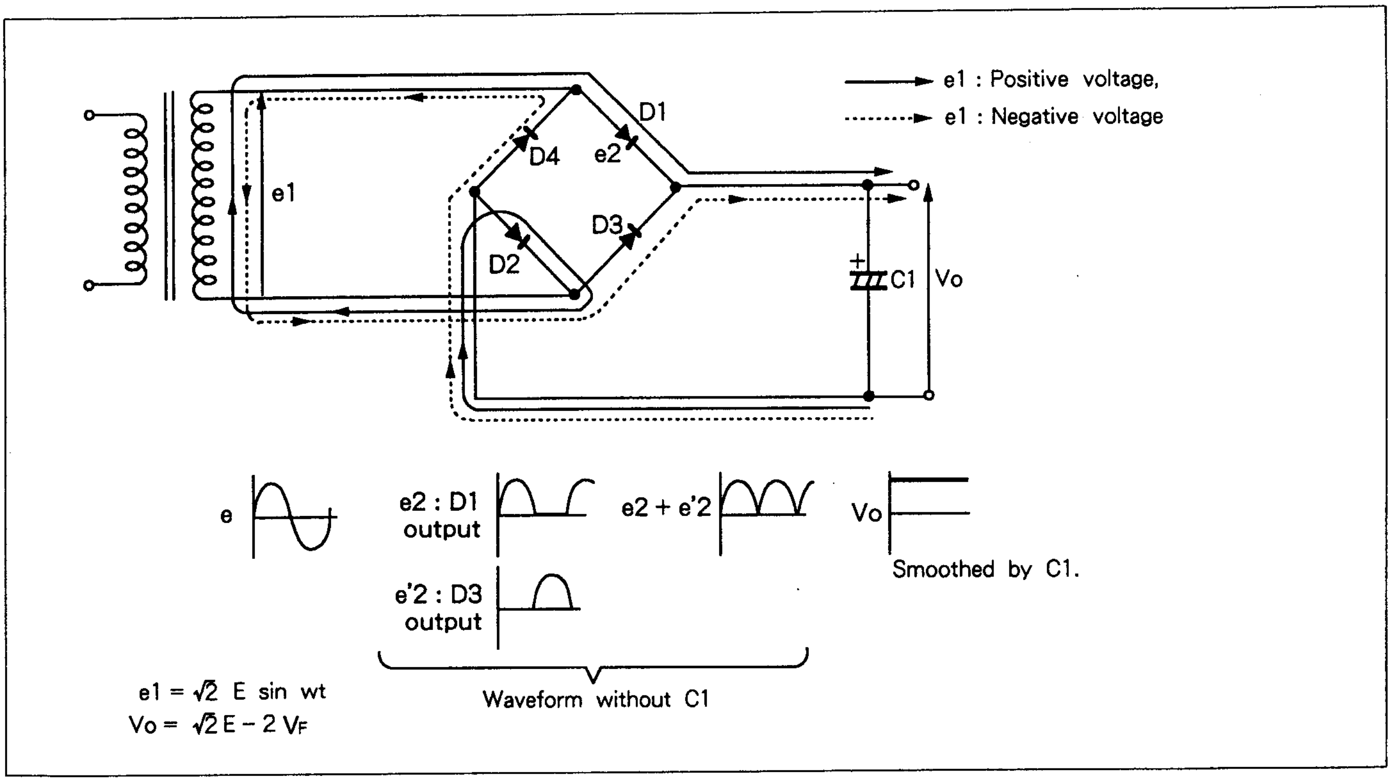
In the bridge rectifying circuit a winding uses all the cycle of the sine wave; and so, the coefficient of utilization of the transformer is high. However; two diodes are in the current route, and the loss in the diodes increases because of output voltage $V_o = 2E - 2V_F$.

On the other hand, the voltage for the diodes is half of the half-wave rectification.

When e1 is positive voltage, diodes D_1 and D_2 are conducted and the current flows as $D_2 \rightarrow$ Transformer $\rightarrow D_1 \rightarrow C_1$.

When e1 is negative voltage, diodes D_3 and D_4 are conducted and the current flows as $D_4 \rightarrow$ Transformer $\rightarrow D_3 \rightarrow$ C.

This model has the circuit in the primary rectifying circuit.


e1 : Positive voltage,
e1 : Negative voltage
e1
D1
D4
e2
D3
D2
+
C1
Vo
e
e2 : D1 output
e2 + e'2
Vo
Smoothed by C1.
e'2 : D3 output
Waveform without C1

$e1 = \sqrt{2}\ E \sin wt$

$V_o = \sqrt{2}E - 2V_F$

Fig. 8-3. Bridge rectifying circuit

※ Ripple : The smoothed DC is a complete DC when unloaded; but when loaded, the charged energy in C_1 is supplied (discharged) and V_o decreases to appear AC a little. This voltage is called "ripple"

8-3. Switching power supply

Switching power supply is the circuit to intermit the input electric energy by switching ON/OFF, connect it to the smoothing circuit composed of the energy charging elements such as coils and condensers, and have output voltage.

The switching power supply has various kinds of circuits like self-excited or separately-excited oscillation and insulated or not-insulated input/output ground.

In case of the not-insulated, DC input and output grounds are connected in common; and in case of the insulated, they are separated.

In case of self-excited oscillation, oscillating occurs in the main switching section; and in case of separately-excited oscillation, it occurs in the other separate section from the main switching section. Thus, switching operation is synchronized with the frequency.

There are two modulations for ON OFF Duty : one is Pulse Width Modulation (fixed frequency and variable ON time) and another is Frequency Modulation (fixed ON/OFF time and variable frequency).

VTR requires many kinds of voltage ; therefore, a ringing choke converter or a flyback converter is adopted.

8-3-1. Basics of Ringing Choke Converter

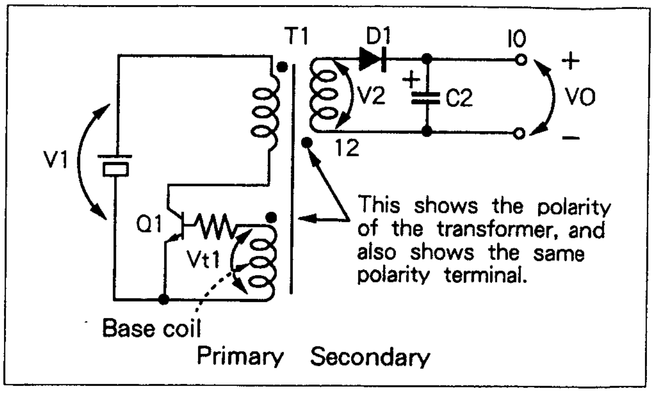
A ringing choke converter (which is self-excited and in which an oscillation circuit is unnecessary) keeps output voltage constant ; as the higher input voltage is (or the lower output voltage is), the higher oscillation frequency becomes automtically. Refer to Fig. 8-4 for the basic circuit of a ringing choke converter and Fig. 8-5 for primary and secondary voltage and current waveforms.

At T_{ON} (Q_1 ON time) magnetic energy is charged from the input side to the transformer T_1, and at T_{OFF} (Q_1 OFF time) the energy is discharged to the output side to have the output energy. At the end of T_{OFF} the voltage waveform of the transformer Vt1 (Fig. 8-5. (C)) is ringing to retrun from 0V to the positive side. This waveform is supplied for the transistor Q_1 base, and triggers upon Q_1 ON. Thus; Q_1 is ON, and then the new cycle starts.

Input voltage V_1 is the rectified input AC voltage.

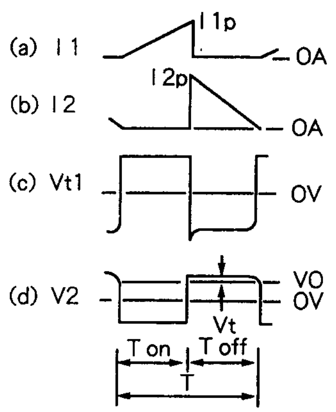
The equivalent circuit at T_{ON} is shown in Fig. 8-6.(a). Transistor Q_1 is ON, and input voltage V_1 is applied across the inductor L_1.

On the other hand; at the secondary side C_2 is discharged, when the current is not supplied for the output diode D_1 as the voltage of the secondary winding is reverse bias (Fig. 8-4. Polarity of the transformer). Therefore, magnetic energy of L_1. $I_1^2/2$ is charged in L_1. Refer to Fig. 8-6. (b) for the equivalent circuit at T_{OFF}.



This shows the polarity of the transformer, and also shows the same polarity terminal.

Fig. 8-4. Basic circuit of Ringing Choke Converter



Marks :

I 1 : Transformer primary current
I 1P : Peak value of I 1
I 2 : Transformer secondary current
I 2P : Peak value of I 2
V1 : Primary input voltage
V2 : Transformer secondary voltage
Vt1 : Transformer primary voltage
N1 : Winding number of transformer primary coil
N2 : Winding number of transformer secondary coil
N : Winding ratio N2/N1
L1 : Inductance of primary coil
L2 : Inductance of secondary coil

Fig. 8-5. Major waveforms of voltage and current

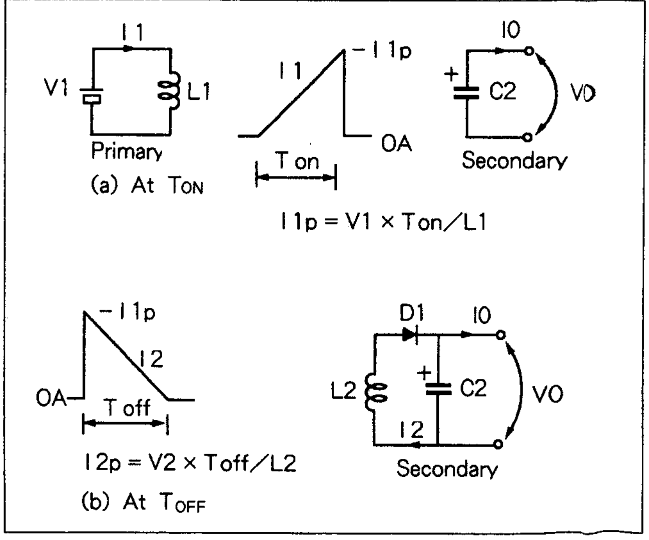


Fig. 8-6. Equivalent circuit of Ringing Choke Converter

The magnetic energy charged in L_1 at T_{ON} is discharged through L_2 to the secondary side. The transformer holds the laws of equivalent amperes and equivalent turns between the primary coil and the secondary coil. Therefore, let the loss in the transformer be 0 :

$$N_1 . I_{1P} = N_2 . I_{2P} \cdots (1)$$

Winding ratio $N = N_2/N_1 \cdots (2)$

then,

Inductor L_1 and L_2 are in proportion to the square of the winding number of the coil :

$$N^2 = (N_2/N_1)^2 = L_2/L_1 \cdots (3)$$

When the output voltage of the transformer is P_2,

$$P_2 = V2 \cdot I_0$$
$$= L_2 \cdot I_2^2 \cdot \eta \cdot f/2 \cdots (4) \quad (f = 1/T)$$

└It is because the unit is 1sec.

$$V2 = V_0 + V_f + V1 \cdots (5) \text{ (From Fig. 8-7.)}$$

η is the transmission efficiency of the transformer.

From the (5) expression :

$$I_{1P} = \frac{2 \cdot P_2 \cdot T}{\eta \cdot V_1 \cdot T_{ON}} = \frac{2 \cdot P_2}{\eta \cdot V_1 \cdot D} \cdots (6)$$

$D = T_{ON}/T$ is Duty ratio :

$$N = \frac{V_2\ (T - T_{ON})}{V_1 \cdot T_{ON}} \cdots (7)$$

$$L_1 = \frac{V_1^2 \cdot T_{ON}^2 \cdot \eta}{2 \cdot V_2 \cdot I_0 \cdot T} = \frac{V_1 \cdot T_{ON}}{I1_P} \cdots (8)$$

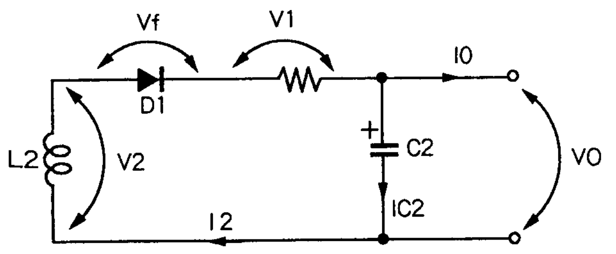
$$V_{CE} = V_1 + \frac{V_2}{N} \cdots (9)$$

The aboves are basic expressions.

Duty D should be 0.5max for the best design.

The strong point of the Ringing Choke Converter is found from the (8) expression as follows :

The higher the input voltage (or the lower the output voltage) is, or the lower L_1 is, the higher the frequency becomes.



Vf : D1 forward voltage
V1 : The voltage by the printed wire pattern resistance

Fig. 8-7. **Relation of the secondary voltage and current**

8-4. Switching power supply circuit

The block diagram of the power supply and operation timing waveforms are shown in Figures 8-9 and 8-10 respectively.

8-4-1. Features

- Ringing Choke Converter with FET used for the main switching element.

8-4-2. Merits

- Voltage-driving FET makes driving electric power low.
- FET can control from high frequency to low frequency easier than a transistor.
  Recommendable oscillation frequency : 30kHz to 300kHz
- High switching speed makes the loss in FET very low.

8-4-3. Basic characteristics of FET

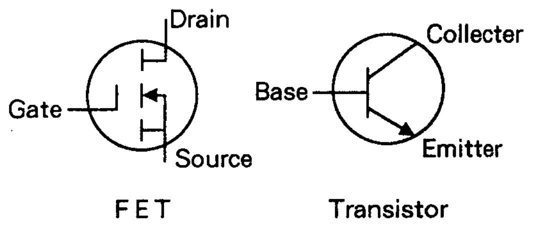


Fig. 8-8.

〈1〉 **Electrical characteristics**

- Gate voltage is more than Vth (gate threshold voltage, 3V normally), and drain-source is ON. (Confirm the value without fail as there is a FET for logic IC.)
- Gate voltage should be 10V and more to saturate drain-source.
- Capacity (input capacity Ciss) of the condenser between drain and source is larger than a transistor.
- Little change in thermal characteristics.
- $R_{DS(ON)}$ (ON resistance between drain and source) corresponds to the transistor $V_{CE(SAT)}$, and it means the resistance between drain and source measured by the specified gate-source voltage and the specified drain current. It is positive thermally.
- Safe operation range is provided by secondary yield for a transistor and enough delating is required, but for FET it is provided by power loss alone.

〈2〉 **Instructions**

- Do not measure gate voltage directly.
- Handle carefully as it is easy to be broken by static electricity. → Insert zener diode or resistance between gate and source.

8−4−4. Switching power supply operation

〈1〉 Starting and basic operation

1) When plugged in, AC flows through line filter L5001, L5002 to be rectified to DC by bridge diode D5001 (bridge rectification).
2) Current flows through starting resistances R5005, R5006 to charge condenser C5008.
3) Current flows through R5007, R5008 to be supplied for the gate of FET Q5001.
4) When condenser C5008 voltage is over FET threshold voltage, Q5001 is ON.
5) When FET Q5001 is ON, current is carried to primary winding N_P, and causes voltage for drive winding N_B.
6) Condenser C5008 is charged through diode D5004 by a drive winding, and FET Q5001 gate is supplied voltage through resistance R5007, R5008.
7) If the current in primary winding N_P is I_P and the inductance of N_P is L_P, then $I_P = V_{IN} \cdot T/L_P$ and I_P increases in proportion to time T.
8) As the current I_P (FET Q5001 drain current) increases, voltage is created across detecting resistance R5015 to supply current for transistor Q5002 base through diode D5008.
9) When Q5002 base is supplied current, Q5002 is ON and draw transistor Q5003 base current, and transistor Q5003 is ON.
10) When transistor Q5003 is ON, FET Q5001 gate voltage is drop.
11) This gate voltage drop induces the increase of Q5001 V_{DS}, N_P voltage drop, and N_B output drop.
12) This change is fed back positively, Q5003 is ON, FET input capacity is rapidly discharged, and Q5001 is OFF.
13) When Q5001 is OFF, the energy in the transformer is discharged through diode D5120 as secondary current.
14) When the energy is completely discharged, drive winding has ringing, FET Q5001 is ON.

The aboves are basic operations, and constant voltage operation is required for the second oscillation.

〈2〉 Stabilization of output

Output is stabilized by photocoupler D5011, shunt regulator IC511, and voltage-dividing resistance R5105, R5106.

The higher output is, the higher the divided voltage becomes.

Current (IC511 cathode current) flows through the diode of photocoupler D5011, and photocoupler D5011 supplies current for Q5002 base. Then, follow the preceding (9).

This model switching power supply adopts 6V (5.8V) control.

The output voltage is decided as follows ;

$$I_{R5103} = V_{REF}/R5105$$
$$V_{06} = V_{REF} + R5106 \cdot I_{R5106} = V_{REF}\,(1 + R5106/R5105)$$
$$I_{R5103} = I_{R5106}$$

V_{REF} : IC511 reference terminal voltage 2.5V

〈3〉 Protection circuit

As output current increases, FET Q5001 drain current increases and voltage is created across detecting resistance (R5015). When this voltage is over transistor Q5002 V_{BE} (ON) + V_F, Q5002 is ON and FET Q5001 is OFF to break the output.

〈4〉 FET gate protection

FET gate is protected by zener diodes D5006 and diode D5007. Even if the voltage for FET Q5001 gate exceeds V_{GSS} (gate voltage maximum absolute rating), it can be clipped by D5006 and D5007 not to exceed the rating.

〈5〉 FET drive circuit

It is composed of transistors Q5002, Q5003, resistors R5010 & R5013, and condenser C5013.

To lower the switching loss, it is necessary to shorten FET $T_{ON\text{-}OFF}$ (time from ON to OFF); for which FET input capacity should be discharged rapidly.

When drive winding N_B is Low, Q5002, Q5003 is OFF, and current is supplied for gate.

On the other hand, when drive winding N_B is High, Q5002, Q5003 is ON, and the input capacity is dischaged rapidly.

8−4−5. Secondary series power supply

Secondary circuit is composed of IC SI-3120CA, transistor Q5101 12V regulator, transistor Q5102 5V regulator, transistor Q5103, Q5104 13V regulator, and power supply for fluorescent display tube.

〈1〉 SI-3120CA

12V-output, low-loss, and 5-terminal regulator

Built-in protection circuit against over-voltage, over-current, and over-heating

Function of pins:

Pin 1 : GND
Pin 2 : output ON/OFF (H : ON ; L : OFF)
Pin 3 : output
Pin 4 : remote sensing terminal
Pin 5 : input

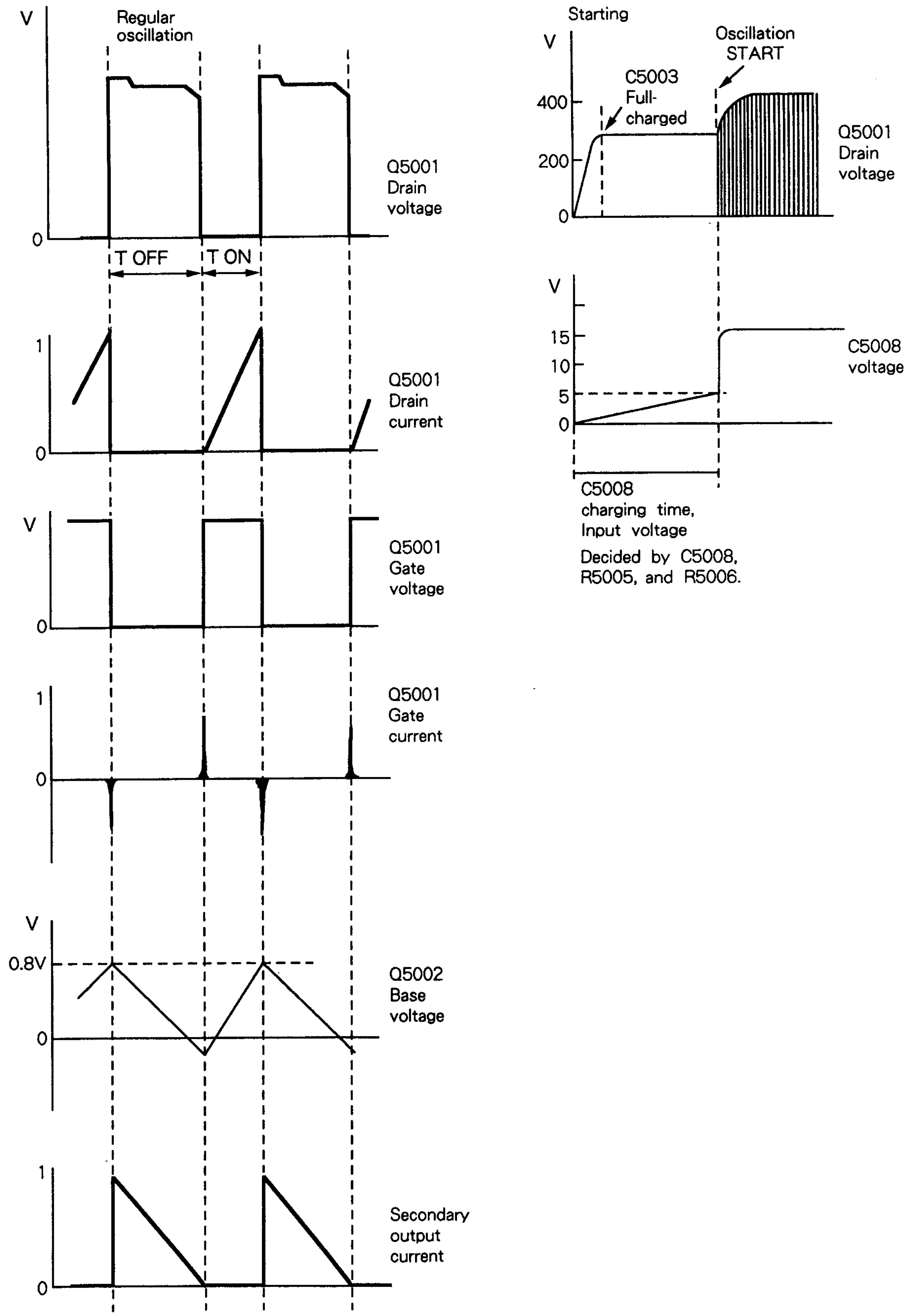
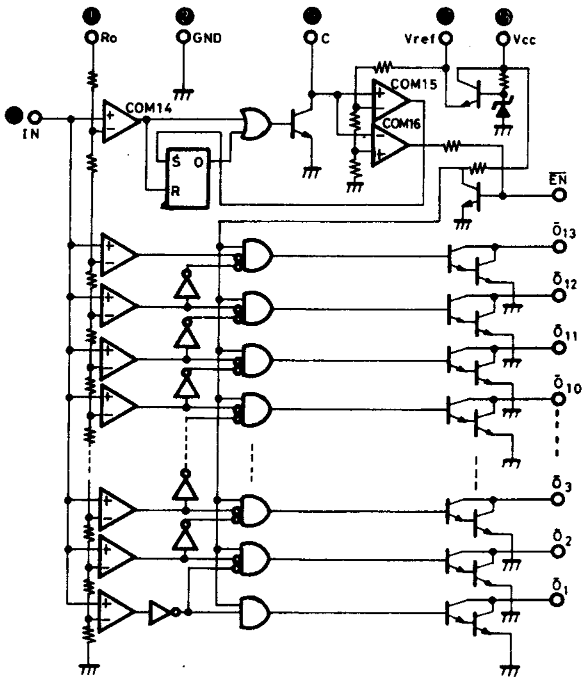


Fig. 8-10. Operation, timing waveforms

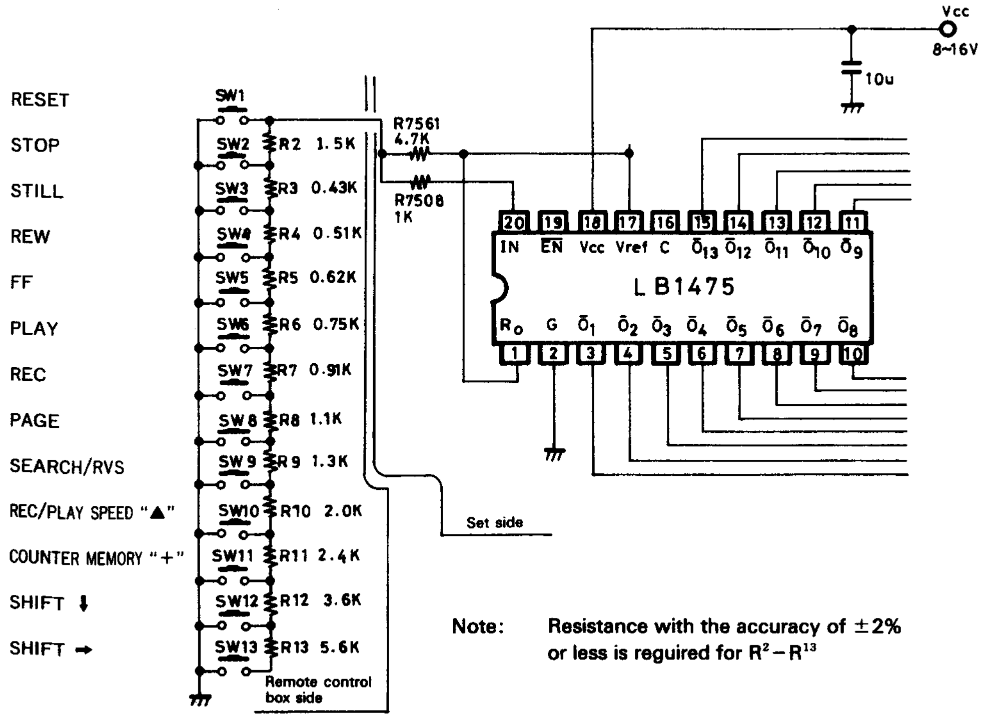
9. EXTERNAL REMOTE CONTROL CIRCUIT

Remote control is two-cord type wired remote control. LB1475 is used as decode IC and Fig. 9−1 shows the block diagram of the equivalent network. As for the operation, voltage applied to input 20 pin is compared by 13 comparators inside to judge which voltage range it belongs to. Then the open collector for output is turned on. Fig. 9−2 shows the external remote control circuit. When the remote control wiring is long, R2 can be adjusted according to the resistance of the wiring.



Ro
GND
C
Vref
Vcc
IN
COM14
COM15
COM16
S
O
R
EN
Ō13
Ō12
Ō11
Ō10
Ō3
Ō2
Ō1

Fig. 9−1. Block diagram of the equivalent circuit



RESET
STOP
STILL
REW
FF
PLAY
REC
PAGE
SEARCH/RVS
REC/PLAY SPEED "▲"
COUNTER MEMORY "+"
SHIFT ↓
SHIFT →
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
R2 1.5K
R3 0.43K
R4 0.51K
R5 0.62K
R6 0.75K
R7 0.91K
R8 1.1K
R9 1.3K
R10 2.0K
R11 2.4K
R12 3.6K
R13 5.6K
Remote control box side
R7561 4.7K
R7508 1K
Set side
Vcc
8~16V
10u
20 19 18 17 16 15 14 13 12 11
IN EN Vcc Vref C Ō13 Ō12 Ō11 Ō10 Ō9
LB1475
Ro G Ō1 Ō2 Ō3 Ō4 Ō5 Ō6 Ō7 Ō8
1 2 3 4 5 6 7 8 9 10

Note: Resistance with the accuracy of ±2% or less is reguired for $R^2 - R^{13}$

Fig. 9−2. External remote control circuit

The output from the decoder is O_1-O_{13} : O_1 is used for resetting microcomputer and O_2-O_{13} enter 12 TO 4 encoder in Fig. 9−3 to be processed to be 4-bit signal and enter REMOTE A-D port of MPU. Operation principle of 12 TO 4 is described in the following using Fig. 9−4.

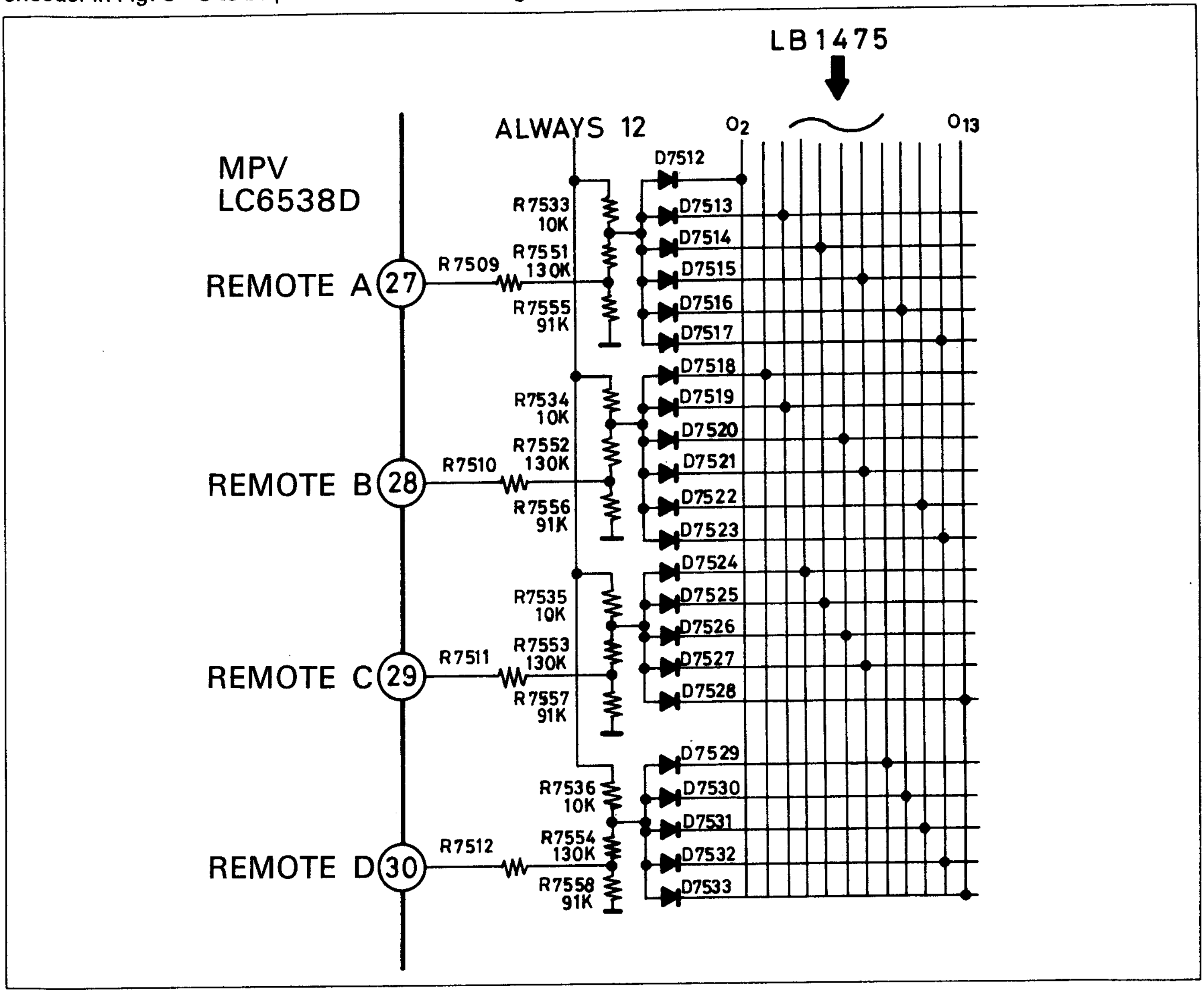
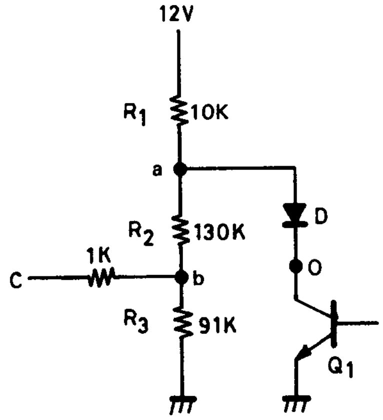

LB1475
ALWAYS 12
O2
O13
MPV
LC6538D
REMOTE A
27
REMOTE B
28
REMOTE C
29
REMOTE D
30
R7509
R7510
R7511
R7512
R7533 10K
R7551 130K
R7555 91K
R7534 10K
R7552 130K
R7556 91K
R7535 10K
R7553 130K
R7557 91K
R7536 10K
R7554 130K
R7558 91K
D7512
D7513
D7514
D7515
D7516
D7517
D7518
D7519
D7520
D7521
D7522
D7523
D7524
D7525
D7526
D7527
D7528
D7529
D7530
D7531
D7532
D7533

Fig. 9−3. 12 TO 4 encoder


12V
R1
10K
a
R2
130K
1K
C
b
R3
91K
D
O
Q1

	a	b
When Q_1 is ON	0.6 (V)	0.25 (V)
When Q_1 is OFF	$\frac{R_2+R_3}{R_1+R_2+R_3}\times 12$ ‖ 11.5 (V)	$\frac{R_3\times 12}{R_1+R_2+R_3}$ ‖ 4.7 (V)

Fig. 9−4. 12 TO 4 operation principle

When Q_1 is turned ON, D is activated and point (a) is 0.6V and point (b) is 0.25V as 0.6V is divided by the resistance R^2 and R^3. As the input impedance of MPU is high, the voltage at point (b) is applied to C straight forward. Therefore, C becomes low.

When Q_1 is turned OFF, D is open and voltage divided by the resistance R_1, R_2 and R_3 is applied to point (b). Therefore, the voltage there is 4.7V and C becomes high.

In order to make use of 12 TO 4 in this circuit, combination must be so made that output from REMOTE A-D port becomes 4-bit signal against the input of O_2-O_{13}. Fig. 9−3 shows the combinations to realize Table 9−1.

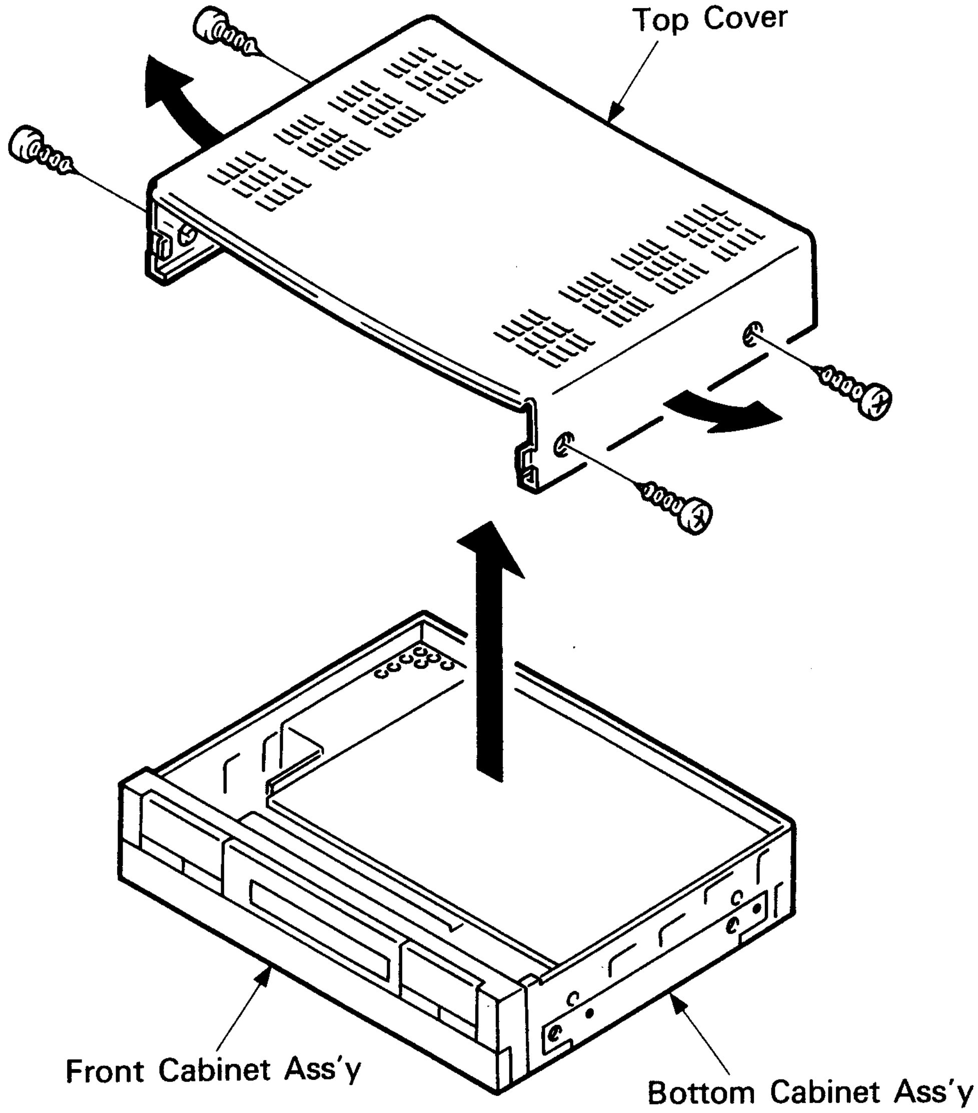
For example, in order to change O_7 to 4-bit, REMOTE B and C must be low. Therefore, D7520 and D7526 are put to the resistance on the side of REMOTE B and C.

As for input to MPU, as shown in Table 9−2, SET and ENTER can be input as well.

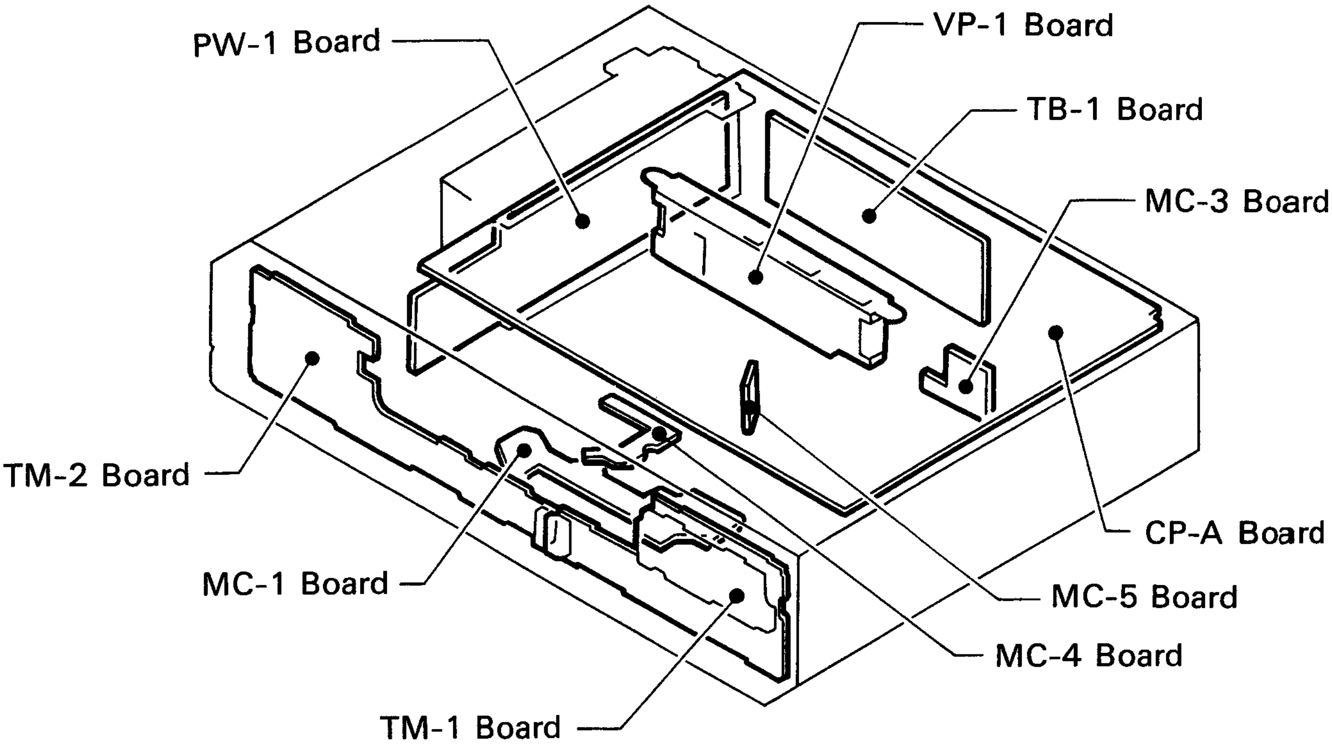
Table 9−2 Combination of O_2-O_{13} and MPU input

REMOTE		O_2	O_3	O_4	O_5	O_6	O_7	O_8	O_9	O_{10}	O_{11}	O_{12}	O_{13}			
REMOTE A	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
REMOTE B	H	H	L	L	H	H	L	L	H	H	L	L	H	H	L	L
REMOTE C	H	H	H	H	L	L	L	L	H	H	H	H	L	L	L	L
REMOTE D	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L
Operation	No input	STOP	STILL/PAUSE	REW	F・F	PLAY	REC	PAGE	SEARCH/RVS・PLAY	▲ (PLAY/REC SPEED)	+ (CNT/MEMORY)	⬇	➡			DON'T CARE

10. TOP COVER REMOVAL & CIRCUIT BOARD LOCATIONS

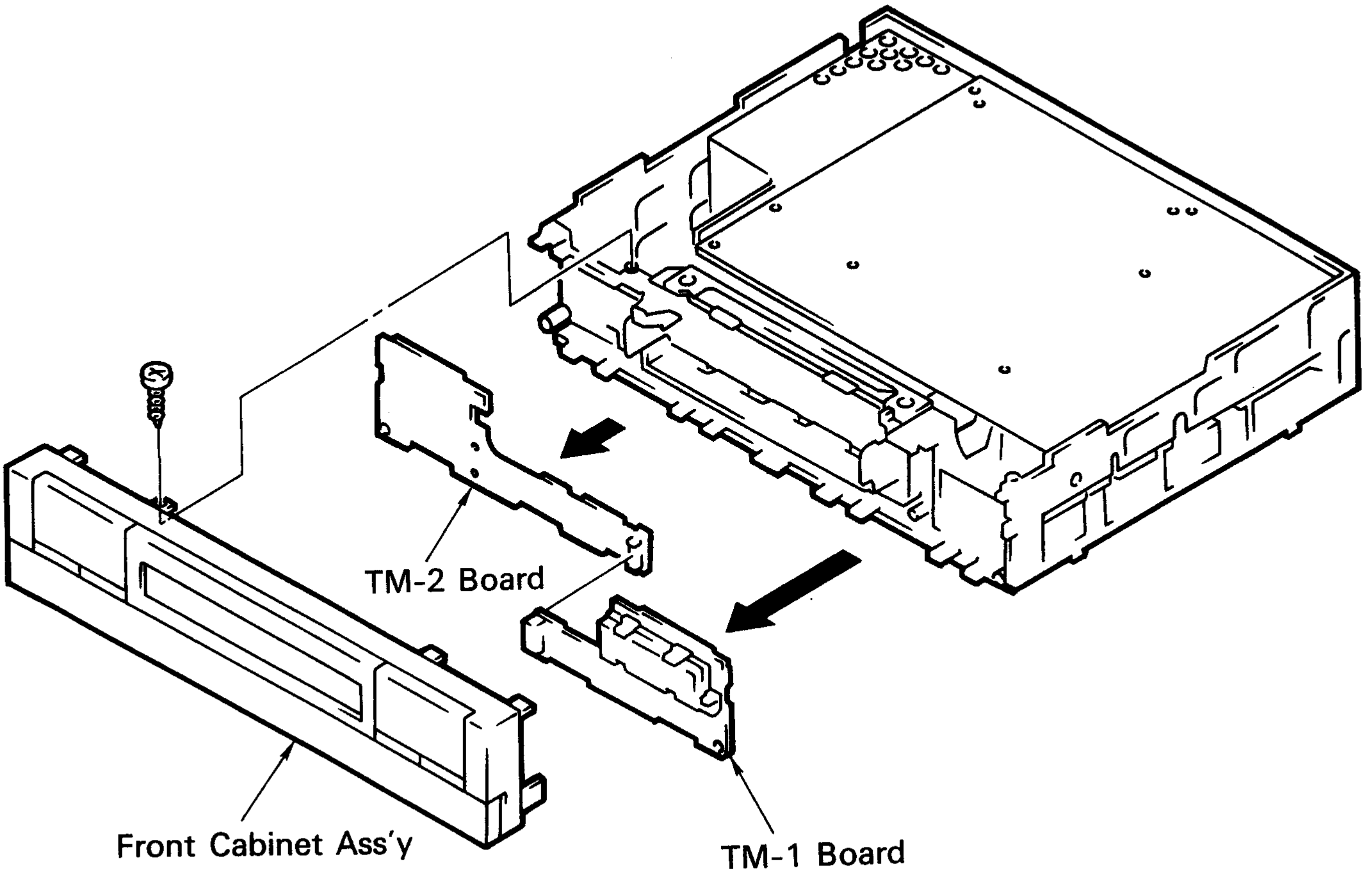

Top Cover
Front Cabinet Ass'y
Bottom Cabinet Ass'y

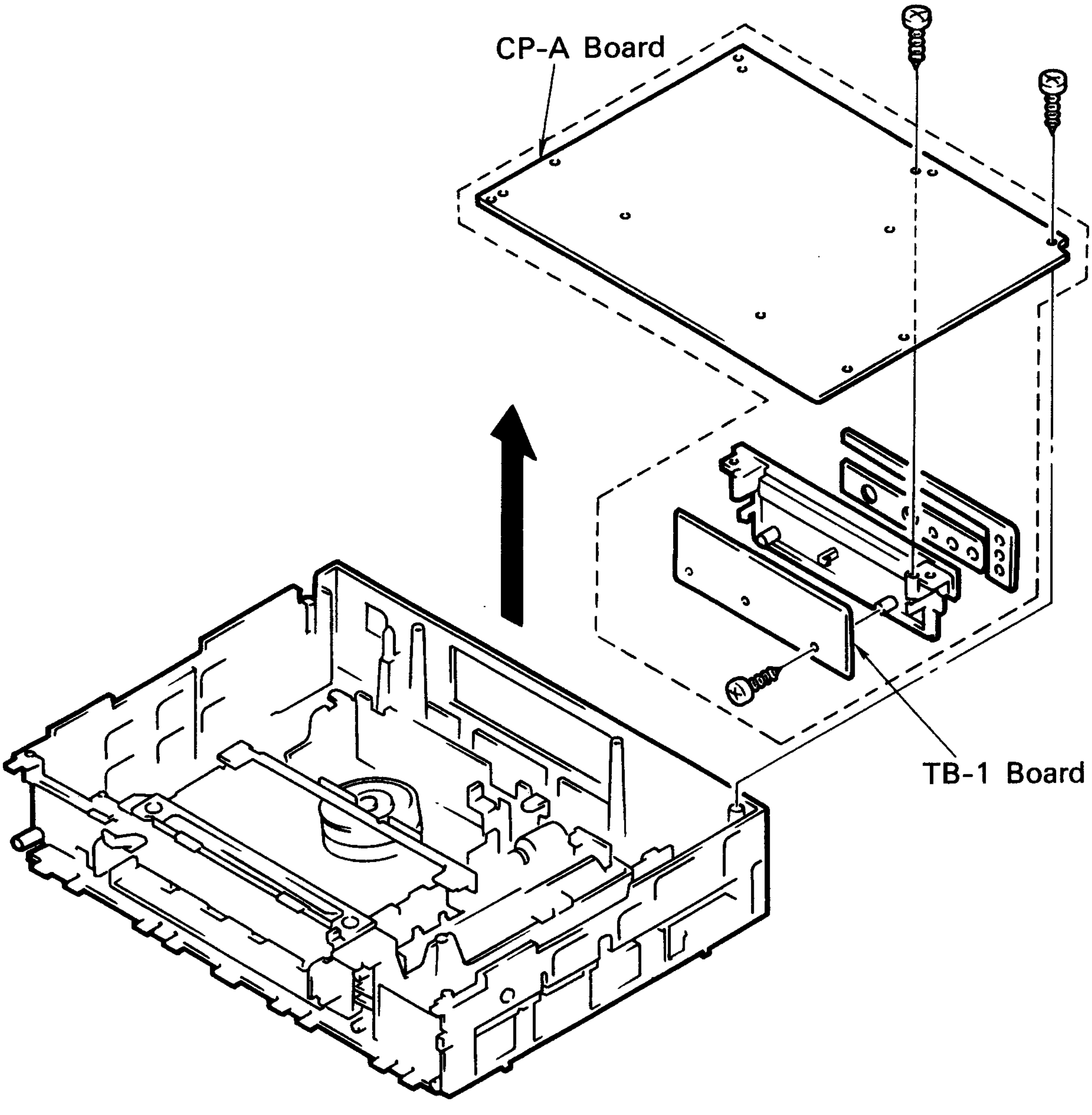
CIRCUIT BOARD LOCATIONS


PW-1 Board
VP-1 Board
TB-1 Board
MC-3 Board
TM-2 Board
CP-A Board
MC-1 Board
MC-5 Board
MC-4 Board
TM-1 Board

Note : CP-A board contains VD-A, AD-A, SV-A, SY-A and TM-A boards.

11. CIRCUIT BOARD REMOVAL


TM-2 Board
Front Cabinet Ass'y
TM-1 Board


CP-A Board
TB-1 Board

12. VCR ADJUSTMENTS

12-1. MECHANISM MAINTENANCE AND CHECKING

12-1-1. PERIODIC CHECKING AND MAINTENANCE ITEMS AND SERVICE JIGS

The following maintenance and periodic checking procedures are recommended to ensure proper operation, and to protect the tape from dirt and damage. Also these procedures should always be followed after repairing the unit.

(1) PERIODIC CHECK ITEMS

○ Cleaning ◎ Confirmation △ Lubrication □ Exchange

Part	Usage Time (hours)	500H	1000H	1500H	2000H	2500H	3000H	3500H	4000H	4500H	5000H
Tape Path System	ASSY, HOLDER, BAND		◎		□		◎		□		◎
	COMPLE, CYLIDER, 2N4P	○	○	○	○	○	○	○	○	○	○
	ASSY, CYLINDER, UPR, 2N4P	○	◎ (□)	◎ (□)	◎ (□)	◎ (□)	◎ (□)	◎ (□)	◎ (□)	◎ (□)	◎ (□)
	SPECIAL WASHER	○	○	○	○	○	○	○	○	○	○
	TAPE GUIDE	○	○	○	○	○	○	○	○	○	○
	COMPL, BRACKET, HEAD	○	○	○	○	○	□	○	○	○	○
	ASSY, LEVER, REV GUIDE	○	○	○	○	○	○	○	○	○	○
	COMPLE, PINCH POLLER	○	○	○	□	○	○	○	□	○	○
	ASSY, GUIDE, ROLLER	○	○	○	○	○	○	○	○	○	○
	HEAD, FULL ERASE	○	○	○	○	○	□	○	○	○	○
	ROLLER, IMPEDANCE				○ △				○ △		
	COMPL, LEVER, CLEANER		◎		◎		□		◎		◎
	ASSY, EARTH, CYL.						□				
Reel Drive System	ASSY, REEL, SUPPLY		○		○ △		○		○ △		○
	ASSY, REEL, TAKE UP		○		○ △		○		○ △		○
	ASSY, GEAR, ONEWAY		○		○ △		○		○ △		○
	GEAR, REEL TAKE UP		○		○ △		○		○ △		○
	COMPLE, IDLER,CLUTCH				△				△		
	ASSY, IDLER		◎		◎		□		◎		◎
	PULLY, REEL				△				△		
	MOTOR, CAPSTAN	○	○	○	○	○	○	○	○	○	□
	BELT, REEL DRIVE				□				□		
	ASSY, GEAR, FRICTION		◎		△ □		◎		△ □		◎
Brake	ASSY, BRAKE SUB T		◎		◎		◎□		◎		◎
	ASSY, BRAKE, SUPPLY		◎		□		◎		□		◎
	ASSY, BRAKE, TAKE UP		◎		□		◎		□		◎
	ASSY, BRAKE, CAPSTAN		◎		□		◎		□		◎
Loading Drive System	HOLDER, WORM				△				△		
	ASSY, LOADING MOTOR						□				
	BELT, LOADING				□				□		
	GEAR, HELICAL				△				△		
	CAM, MODE				△				△		
	CAM, MAIN				△				△		
Performance Check	FF, REW, REV, PLAY TORQUE		◎		◎		◎		◎		◎
	PLAY B · T TORQUE		◎		◎		◎		◎		◎

Note : The back tension torque is the value that has been measured by the cassette torque meter (VHJ-0016). The torque of FF, REV, REW, and PLAY represent those measured with them locked by the torque guage. FF and REW are values 2 seconds after starting.

Torque value :
FWD : 600 gcm or more
REW : 600 gcm or more
PLAY (3H) : 100 to 160 gcm
REV : 210 to 280 gcm
Back tension : 52 ± 13 gcm

(2) CLEANING

1. Drum (COMPL CYLINDER) and Video Heads (See Fig.12-1-1.)

1) Wrap a chamois leather around your finger and moisten it with methyl alcohol.
2) Move the chamois leather to left and right several times on the video head to clean. There is a video head also on the opposite side, so clean it likewise. In this models, clean the audio head also.
3) Clean the tape path surface of the cylinder in the same way.

Note: Always turn power off before cleaning. Never move the chamois leather vertically or apply too much force to the head ; it may be damaged.

2. Cleaning of the Tape Guide System (See Fig.12-1-2.)

Set the EJECT mode and clean the tape guide system (tape guides, impedance roller, FTE head, ACE head, pinch rollers, capstan axles, etc.) with a chamois leather moistened with methyl alcohol.

Note: Make sure that no oil, grease, etc. adhere to the chamois leather and that heads are not damaged.

3. Cleaning of the Drive System

Clean the drive system (loading belt, reel drive belt, pulley, supply reel table, etc.) with a soft cloth moistened with methyl alcohol.

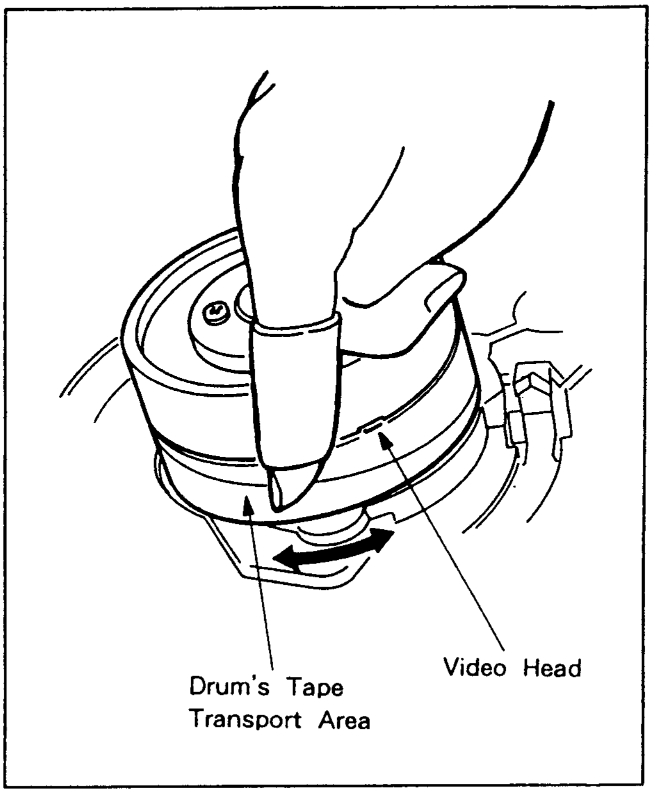

Video Head
Drum's Tape Transport Area

Fig.12-1-1.

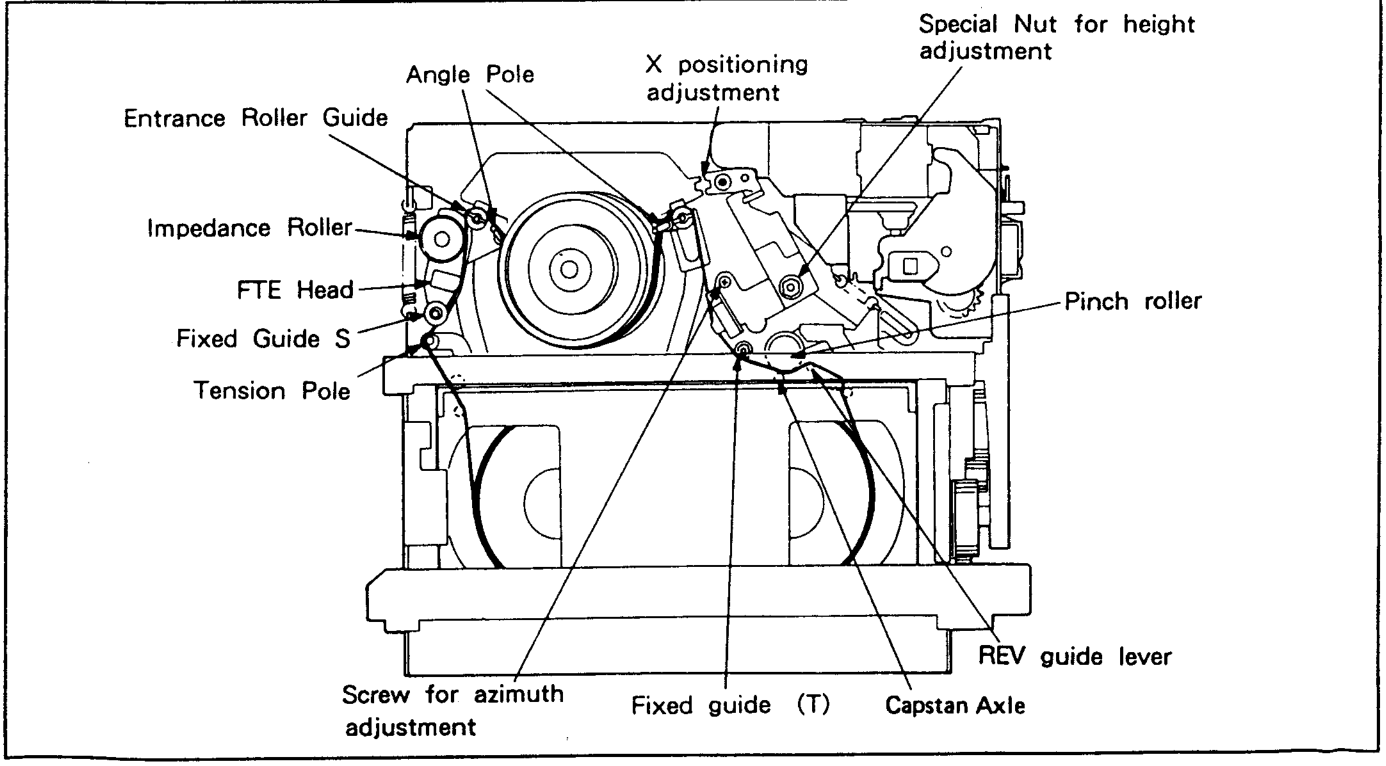
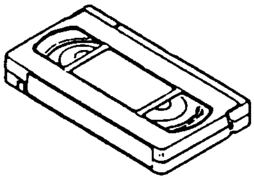

Special Nut for height adjustment
Angle Pole
X positioning adjustment
Entrance Roller Guide
Impedance Roller
FTE Head
Fixed Guide S
Tension Pole
Pinch roller
REV guide lever
Screw for azimuth adjustment
Fixed guide (T)
Capstan Axle

Fig.12-1-2. **Cleaning**

(3) Service Jigs

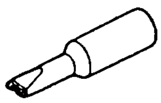
No.	Jig	Jig No.	Remarks
1	Alignment tape	VHJ-0008	SP color bar, 1kHz (normal)
2	Alignment tape	VHJ-0009	SP monoscope, 6kHz (normal)
3	Alignment tape	VHJ-0052	SP monoscope, 6kHz (normal)
4	Eccentric screwdriver	VHJ-0003	For tape path adjustment
5	Nut box	VHJ-0048	For tape path adjustment
6	Torque gauge	VHJ-0004	For reel take-up torque measurement
7	Cassette torquemeter	VHJ-0016	For back tention torque measurement
8	Position adjustment gauge	VHJ-0072	For position adjustment
9	Torque gauge screwdriver	VHJ-0014	For screw fastening torque adjustment
10	3 mm dia. bit for torque screwdriver	VHJ-0045	Spare bit for the torque gauge screwdriver
11	Video head removing tool	VHJ-0041	For upper drum removal
12	Cassette stand plate gauge	VHJ-0001	For reel height adjustment
13	Mode selector	VHJ-0050	For mechanism mode selection
14	Mode selector relay board (with VHJ-0076)	VHJ-0075	Relay board for mode selector (For VH-90)
15	7-wire flat cable	VHJ-0076	Extension cable for VHJ-0075 (For VH-90)
16	REV guide lever removing tool	VHJ-0073	For REV guide lever removal
17	Mode selector relay board	VHJ-0087	Relay board for mode selector (For VN-30, 35, 70)

VHJ-0008, VHJ-0009, VHJ-0052



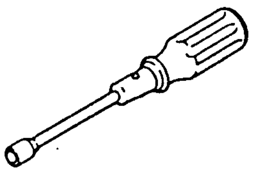
No. 1, 2, 3

VHJ-0003



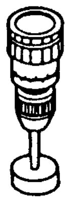
No. 4

VHJ-0048



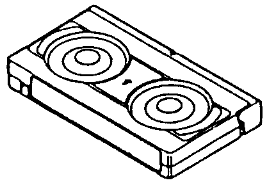
No. 5

VHJ-0004



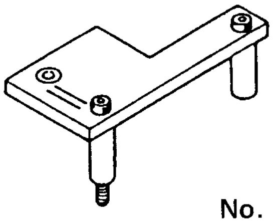
No. 6

VHJ-0016



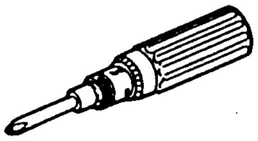
No. 7

VHJ-0072



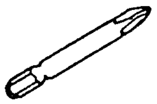
No. 8

VHJ-0014



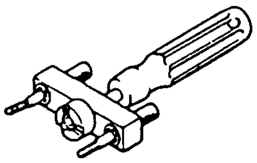
No. 9

VHJ-0045



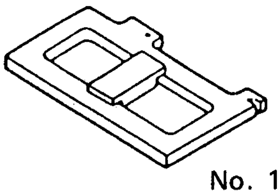
No. 10

VHJ-0041



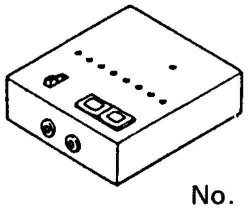
No. 11

VHJ-0001



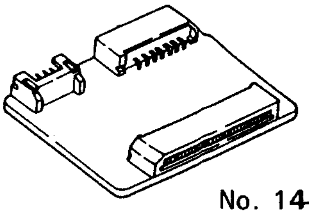
No. 12

VHJ-0050



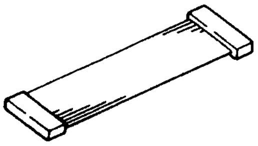
No. 13

VHJ-0075



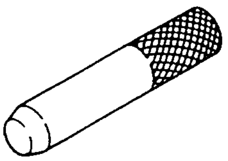
No. 14

VHJ-0076



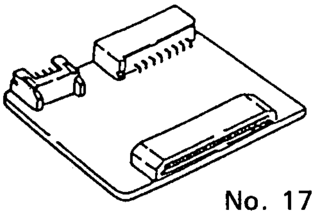
No. 15

VHJ-0073



No. 16

VHJ-0087



No. 17

12-1-2. MODE SELECTOR (VHJ-0050) HANDLING INSTRUCTIONS

The mode selector drives the loading motor of the JOG mechanism with its internal batteries (UM-2×4= 6V), using LEDS to indicate the mode (EJECT, INITIAL, BRAKE, STOP/REW/FWD, PLAY, STILL, R.SLOW, REV) simultaneously with EJECT REV mode changes.
Instead of the internal batteries, an external DC 6V power supply can also be used.

(1) PART NAMES (See Fig. 12-1-3.)

Note : The mechanism mode indicator is different from that of the mechanism shown in P 90 and P 91. In case of using the indicator for JOG/SHUTTLE mechanism, change the indicator to display STILL → PLAY, PLAY → STILL, IDLER → R/SLOW, referring to the table below.

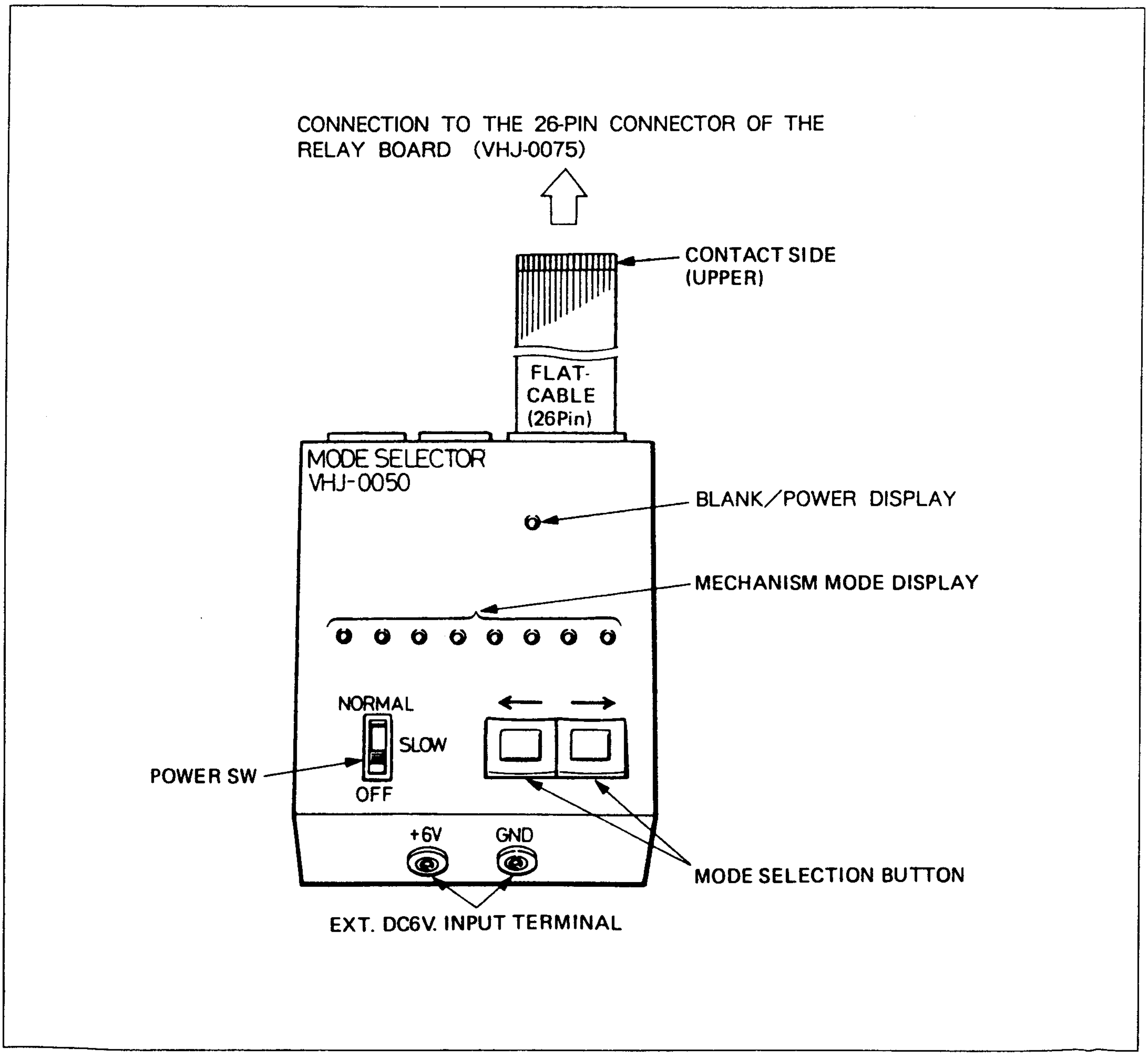

CONNECTION TO THE 26-PIN CONNECTOR OF THE RELAY BOARD (VHJ-0075)
CONTACT SIDE (UPPER)
FLAT-CABLE (26Pin)
MODE SELECTOR VHJ-0050
BLANK/POWER DISPLAY
MECHANISM MODE DISPLAY
NORMAL
SLOW
OFF
POWER SW
←
→
+6V
GND
MODE SELECTION BUTTON
EXT. DC6V. INPUT TERMINAL

Fig. 12-1-3.

P88. P89 mechanism	EJECT	INITIAL	BRAKE	STOP (FF/REW)	STILL	PLAY	IDLER	REV
JOG mechanism	EJECT	INITIAL	BRAKE	STOP (FF/REW)	PLAY	STILL	R.SLOW	REV

(2) CONNECTION METHOD

1. Connection for model VH-90

(See Fig.12-1-4.)

1) Remove the 7-wire cable connected from the system control circuit to the connector (CN822) of the MC-3 board.
2) Connect the 7-wire cable (VHJ-0076) between the connector (CN822) of the MC-3 board and the 7-pin connector of the Mode Selector Connection Board (VHJ-0075).
3) Remove the 6-wire cable extending from the cassette holder section from the connector of the System Control Circuit Board and connect it to the 6-pin connector of the Mode Selector Connection Board (VHJ-0075).
4) Connect a supplied 26-pin flat cable (VHJ-0064) of the mode selector (VHJ-0050) between the mode selector body and the 26-pin connector of the Connection Board (VHJ-0075).

Note: Care should be taken to avoid mistaking the direction of the contacting side when connecting a flexible flat cable.

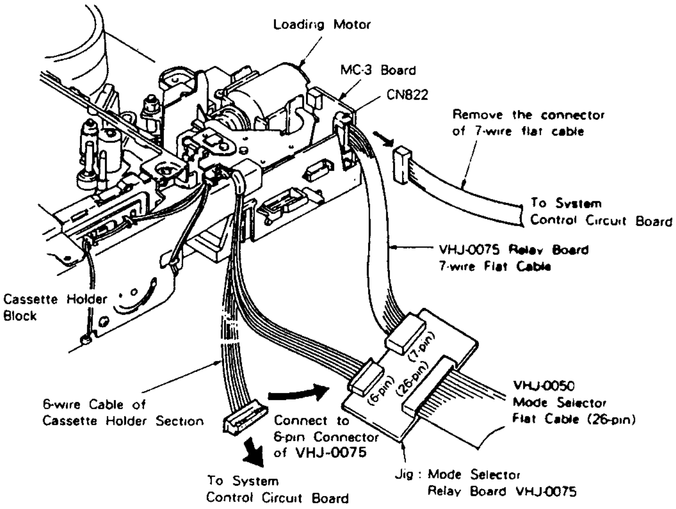

Loading Motor
MC-3 Board
CN822
Remove the connector of 7-wire flat cable
To System Control Circuit Board
VHJ-0075 Relay Board 7-wire Flat Cable
Cassette Holder Block
(7-pin)
(6-pin)
(26-pin)
VHJ-0050 Mode Selector Flat Cable (26-pin)
6-wire Cable of Cassette Holder Section
Connect to 6-pin Connector of VHJ-0075
To System Control Circuit Board
Jig : Mode Selector Relay Board VHJ-0075

Fig.12-1-4. Connection

(3) HANDLING METHOD

1) The mode changes in sequence of EJECT, INITIAL, BRAKE, STOP/REW/FF, STILL, PLAY, IDLER, REV when the right side (⇨) of the mode selector button is kept on pressing.
2) To change the mode from REV to EJECT, press the left side (⇨) of the mode selector button to select the desired mode.
3) In the mid position of each mode during a shift to other mode, the "BLANK" LED lights. But the "PLAY", "IDLER", "REV" LEDs light between the EJECT mode and the INITIAL mode. Be sure therefore to check the mechanism body to see just what state the mechanism is in. Incidentally, if the mode selector is not connected to the mechanism, the "BLANK" LED lights to indicate the power ON.
4) The SLOW position of POWER switch makes relatively slow motions in comparison with the NORMAL position.

Note 1: The mode selector drives the loading motor only, not affecting the head drum motor and the capstan motor. When using the mode selector with a cassette loaded, turn the capstan motor manually to remove tape slackness, preventing tape entanglement.

Note 2: If the Left side (⇦) of the mode selector (VHJ-0050) key is kept pressed with the COMPL cassette mechanism removed, it might get past the EJECT position, causing the front helical gear and the front worm gear to get disengaged.

In this condition, since the front helical gear will not turn even if the right side (⇨) of the mode selector key is pressed, rotate (push) the front helical gear clockwise by hand and engage it with the front worm gear. As there is a misalignment between the mechanism main body operation mode (indicated by the mode selector indicator lamps) and the front loading mechanism operation mode, keep the right side (⇨) of the mode selector key pressed until the front helical gear and the front loading gear of the front loading mechanism get back to the initial condition. (Refer to A and B in Fig.12-2-9.of page 160, (2) Loading Motor.)

When the front loading mechanism returns to the initial condition, operation mode of the whole mechanism gets back to normal, matching the mode shown by the mode indicator lamps (mode EJECT would not be properly indicated during eject).

Sometimes, engagement of the front helical gear with the front worm gear is delayed and operation mode. The mechanism main body gets too much ahead and the front loading mechanism mode cannot be switched to the initial condition. In that case, press the Left side (⇦) of the mode selector key, setting the mechanism main body operation mode back to EJECT (rotation of the mode cam and the MAIN CAM stops).

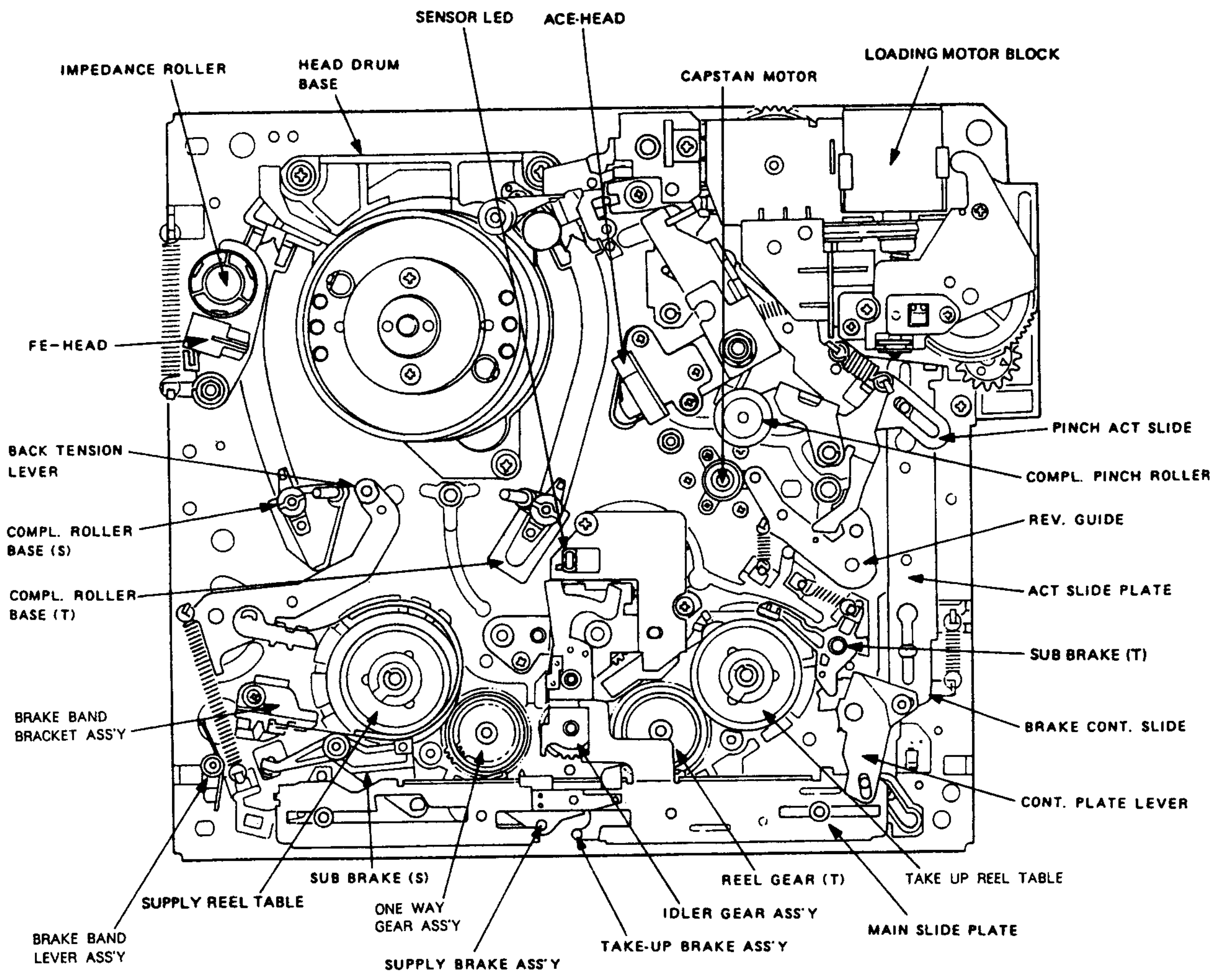
Note 3: The mode indicator lamps show the mechanism operation mode, but the EJECT lamp may sometimes fail to indicate the actual mechanism operation mode.

When setting the mechanism to the EJECT or INITIAL mode for dismounting or reassembling, fine adjustment of the each gear and cam, etc., marking positions is required after the mode indicator lamp has lighted up. Perform this with the mode selector switch in the SLOW position.

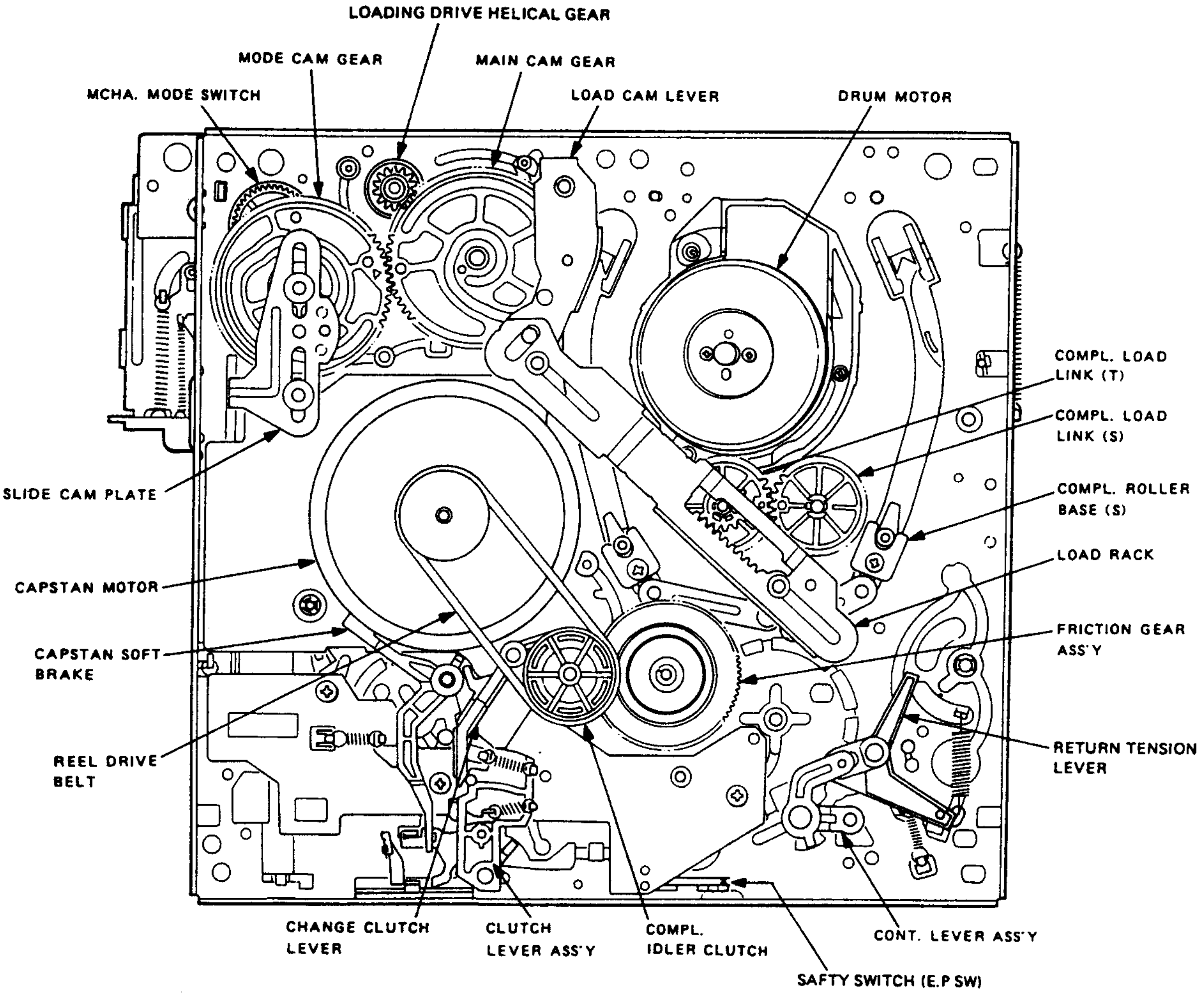
12-2 MECHANISM DISMANTLING AND REASSEMBLING

12-2-1. MAIN MECHANISM PARTS LOCATIONS

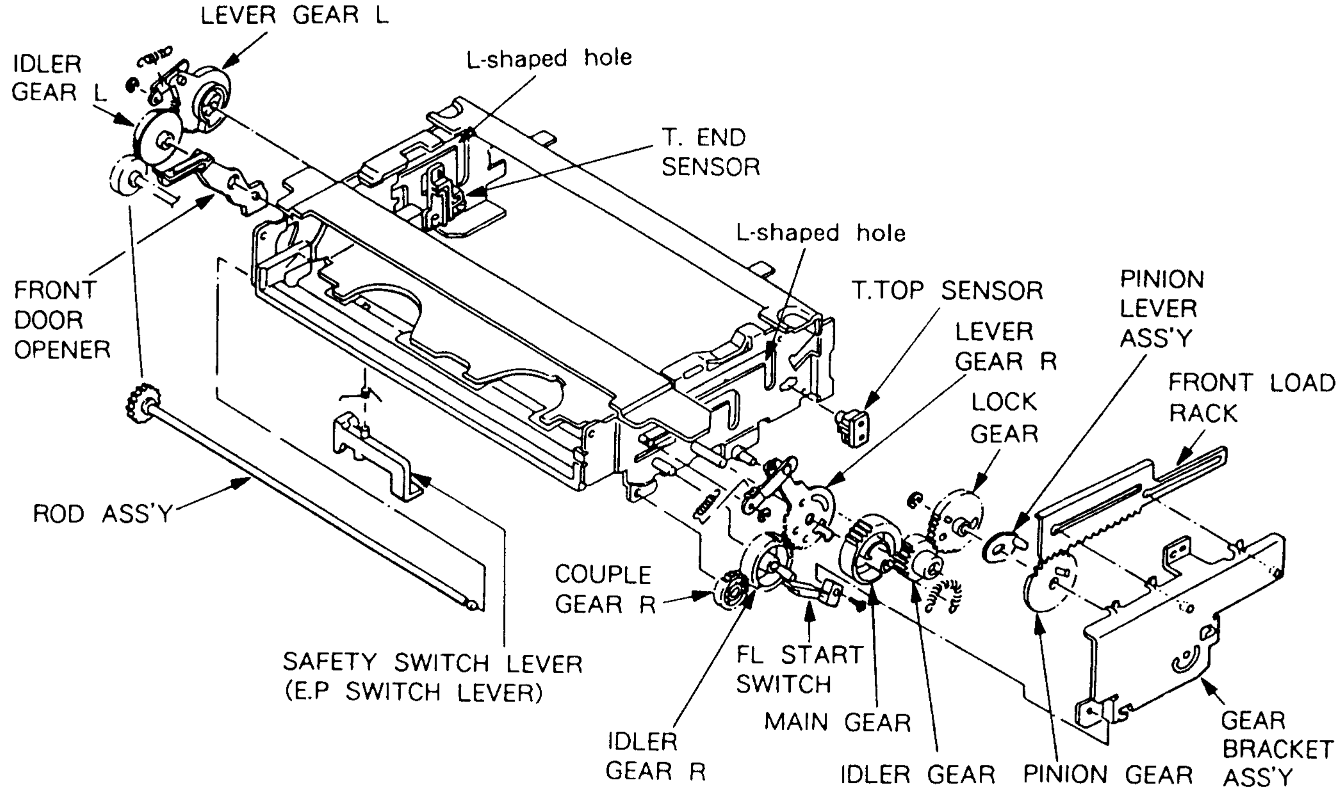
(1) Mechanism Assembly (Top View)


SENSOR LED
ACE-HEAD
IMPEDANCE ROLLER
HEAD DRUM BASE
CAPSTAN MOTOR
LOADING MOTOR BLOCK
FE-HEAD
PINCH ACT SLIDE
BACK TENSION LEVER
COMPL. PINCH ROLLER
COMPL. ROLLER BASE (S)
REV. GUIDE
COMPL. ROLLER BASE (T)
ACT SLIDE PLATE
SUB BRAKE (T)
BRAKE BAND BRACKET ASS'Y
BRAKE CONT. SLIDE
CONT. PLATE LEVER
SUB BRAKE (S)
REEL GEAR (T)
TAKE UP REEL TABLE
SUPPLY REEL TABLE
ONE WAY GEAR ASS'Y
IDLER GEAR ASS'Y
MAIN SLIDE PLATE
BRAKE BAND LEVER ASS'Y
TAKE-UP BRAKE ASS'Y
SUPPLY BRAKE ASS'Y

(2) Mechanism Assembly (Bottom View)


LOADING DRIVE HELICAL GEAR
MODE CAM GEAR
MAIN CAM GEAR
MCHA. MODE SWITCH
LOAD CAM LEVER
DRUM MOTOR
COMPL. LOAD LINK (T)
COMPL. LOAD LINK (S)
SLIDE CAM PLATE
COMPL. ROLLER BASE (S)
LOAD RACK
CAPSTAN MOTOR
FRICTION GEAR ASS'Y
CAPSTAN SOFT BRAKE
RETURN TENSION LEVER
REEL DRIVE BELT
CHANGE CLUTCH LEVER
CLUTCH LEVER ASS'Y
COMPL. IDLER CLUTCH
CONT. LEVER ASS'Y
SAFTY SWITCH (E.P SW)

(3) Front Loading Mechanism


LEVER GEAR L
IDLER GEAR L
L-shaped hole
T. END SENSOR
L-shaped hole
FRONT DOOR OPENER
T.TOP SENSOR
PINION LEVER ASS'Y
LEVER GEAR R
FRONT LOAD RACK
LOCK GEAR
ROD ASS'Y
COUPLE GEAR R
SAFETY SWITCH LEVER (E.P SWITCH LEVER)
FL START SWITCH
MAIN GEAR
GEAR BRACKET ASS'Y
IDLER GEAR R
IDLER GEAR
PINION GEAR

12-2-2. MECHANISM MAIN UNIT (See Fig. 12-2-1.)

1. Removal

1) Remove the connectors of the COMPL MC-3 and the COMPL HEAD BRACKET.
2) Remove the flexible cable ① connecting the COMPL CYLINDER to the PRE-AMP UNIT ③. (See Fig. A.)
3) Remove the two screws ②, then remove the PRE-AMP UNIT ③.
4) Remove the two screws ④, then remove the PRE-AMP BRACKET ⑤.
5) Remove the two screws ⑥.
6) Remove the three screws ⑦ and two screws ⑩, then lift up the mechanism main unit and remove it.
   Since the TRAY ⑧ obstructs removal of the two front screws ⑩, move the TRAY LOCK LEVER ⑨ in the direction of the arrow to unlock, then slide the TRAY ⑧ before removing the screws. (See Fig. B)

Note: Shape of the PRE-AMP UNIT ③ and the PRE-AMP BRACKET ⑤ differ depending on the model.

2. Remounting

1) Mount the mechanism main unit onto the chassis with the three screws ⑦ and two screws ⑩.
2) Tighten the two screws ⑥.
3) Mount the PRE-AMP BRACKET ⑤ with the two screws ④.
4) Mount the PRE-AMP UNIT ③ and the ground lug with the two screws ②. (some models are not provided with a ground lug.)
5) Insert the flexible cable ① into the connector of the PRE-AMP UNIT.
6) Connect the connectors of the COMPL MC-3 and COMPL HEAD BRACKET.

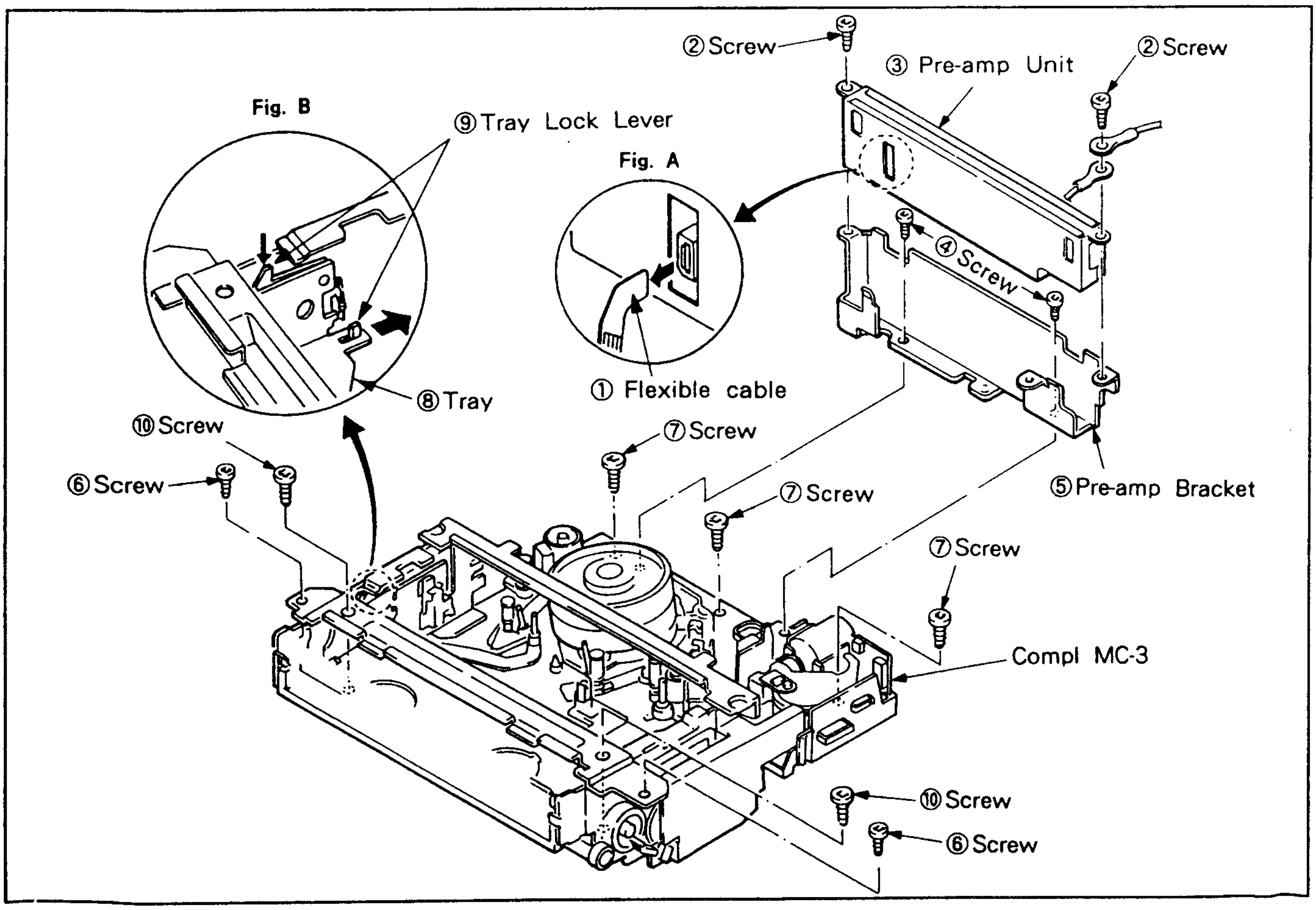

②Screw
③ Pre-amp Unit
②Screw
Fig. B
⑨Tray Lock Lever
Fig. A
④Screw
⑧Tray
① Flexible cable
⑩Screw
⑦Screw
⑥Screw
⑦Screw
⑤Pre-amp Bracket
⑦Screw
Compl MC-3
⑩Screw
⑥Screw

Fig.12-2-1. **Mechanism Main Unit**

12-2-3. CASSETTE MECHANISM ASSEMBLY

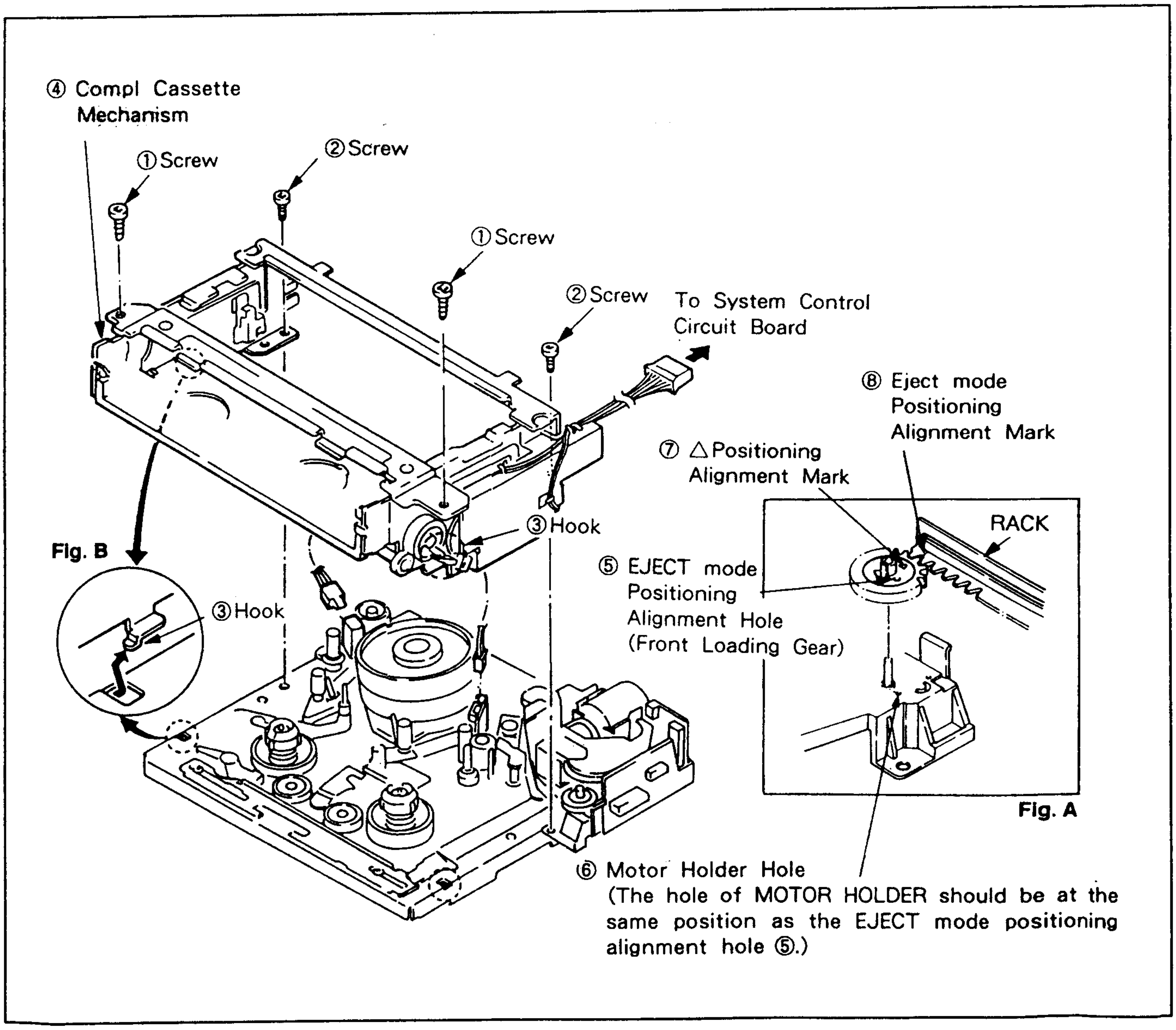
(1) CASSETTE MECHANISM (See Fig. 12-2-2.)

1. Removal

1) Set the video main unit to the EJECT completed mode.
2) Pull out the connectors (6-PIN CONNECTOR connected to the system control circuit board, ACE HEAD CONNECTOR, and FTE HEAD CONNECTOR) from CASSETTE HOLDER.
3) Remove the two screws ①.
4) Remove the two screws ②.
5) Lift up the COMPL CASSETTE MECHANISM ④ back a little and remove the two hooks ③ on the front. (See Fig. B.) When doing so, make sure that the SAFETY SWITCH LEVER is not caught by the mechanism chassis.

2. Remounting

1) Set the chassis section mechanism to the EJECT mode with the mode selector (VHJ-0050) (looking from the top, align the EJECT mode positioning alignment hole ⑤ to the MOTOR HOLDER hole ⑥ as shown in Fig. A).
2) Set the COMPL CASSETTE MECHANISM ④ to the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM ④ onto the mechanism chassis, aligning it with the protuberance.
   Align the EJECT mode positioning alignment mark ⑧ to the △ positioning alignment mark ⑦. (See Fig. A)
4) Fix to the mechanism chassis with the two screws ②.
5) Fix to the chassis with the two screws ①.
6) Connect to the various connectors.


④ Compl Cassette Mechanism
①Screw
②Screw
①Screw
②Screw
To System Control Circuit Board
⑧ Eject mode Positioning Alignment Mark
⑦ △Positioning Alignment Mark
RACK
③Hook
⑤ EJECT mode Positioning Alignment Hole (Front Loading Gear)
Fig. B
③Hook
Fig. A
⑥ Motor Holder Hole

(The hole of MOTOR HOLDER should be at the same position as the EJECT mode positioning alignment hole ⑤.)

Fig.12-2-2. **Cassette Mechanism**

(2) GEAR BRACKET ASS'Y (See Fig. 12-2-3.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in Fig. 12-2-2.
2) Remove the four screws ①, then remove the GEAR BRACKET ASS'Y ② as shown in Fig. A.
3) Remove the E ring ③, then remove the LOCK GEAR ④, the PINION LEVER ASS'Y ⑤, the PINION GEAR ⑥ and the RACK ⑦, in that order.

2. Remounting

1) Apply grease to the shaft ⑧ and the two pins ⑨ of the GEAR BRACKET ASS'Y.
2) Apply grease to the pin ⑩ of the PINION LEVER ASS'Y.
3) Apply grease to the toothed part of the RACK ⑦.
4) Fit the RACK ⑦ onto the two pins ⑨. Align the positioning alignment hole ⑪ to the positioning alignment hole ⑫ of the GEAR BRACKET.
5) Mount the PINION GEAR ⑥, PINION LEVER ASS'Y ⑤, and LOCK GEAR ④ in the shaft ⑧ in the order mentioned.
   Align the positioning alignment holes ⑬ of PINION GEAR and LOCK GEAR with the positioning alignment hole ⑪ of RACK at that time.
6) Mount the E ring ③ onto the shaft ⑧.
7) Set the GEAR BRACKET ASS'Y ② to the dowel and mount it using four screws ①.
   Align the positioning alignment hole Ⓐ of the IDLER GEAR with the positioning alignment hole Ⓑ of the SIDE BOARD as shown in Fig.12-2-4. at this time.
   Also align the positioning alignment holes ⑬ of PINION GEAR and LOCK GEAR with the positioning alignment hole ⑫ of GEAR BRACKET by referring to Fig.12-2-3.After mounting them, check to be sure that FL START SWITCH ⑭ is in the ON state shown in Fig. A.
8) Remount the COMPL CASSETTE MECHANISM as instructed in P.153.

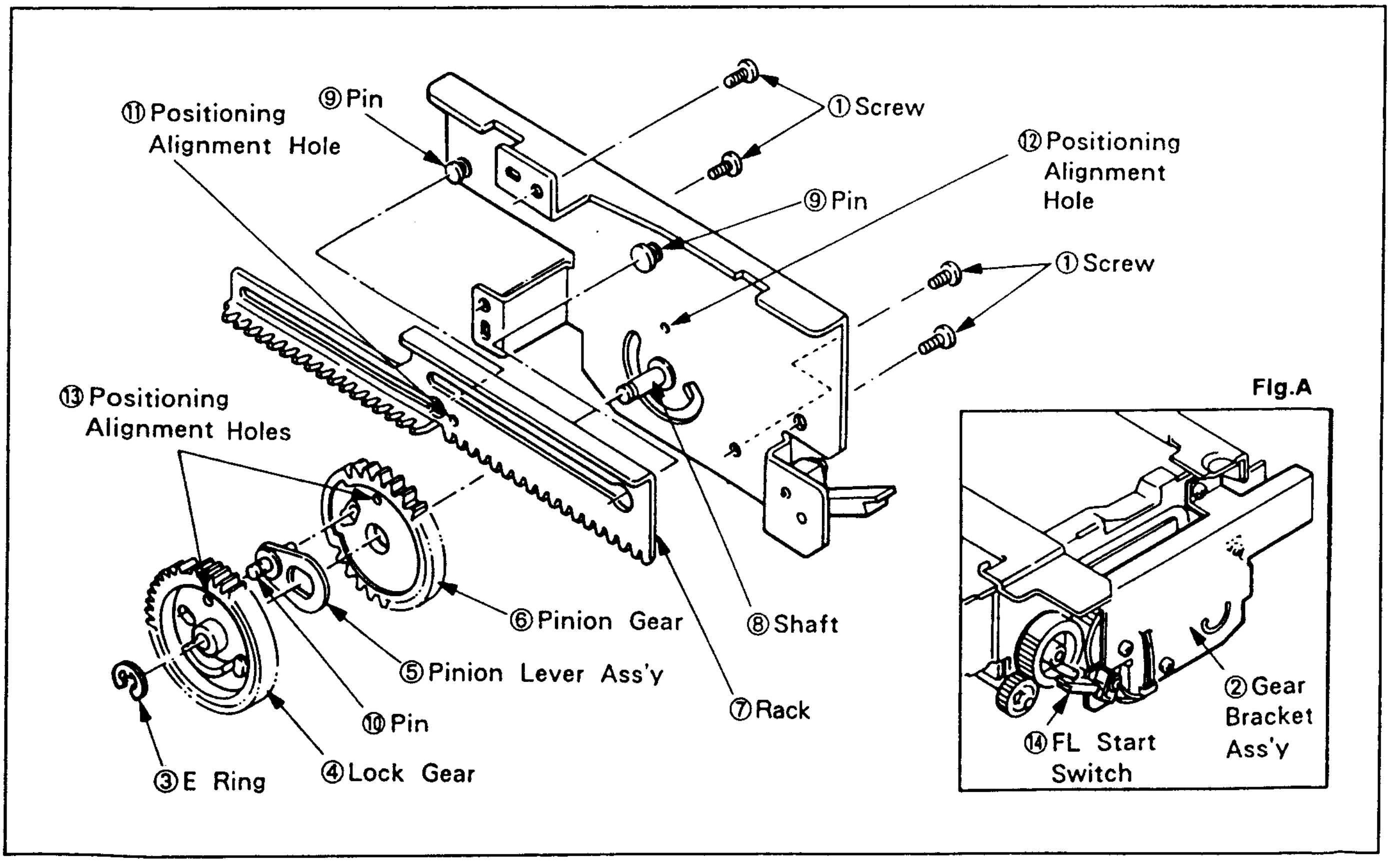

⑪Positioning Alignment Hole
⑨Pin
①Screw
⑫Positioning Alignment Hole
⑨Pin
①Screw
⑬Positioning Alignment Holes
Fig.A
⑥Pinion Gear
⑧Shaft
⑤Pinion Lever Ass'y
⑩Pin
⑦Rack
③E Ring
④Lock Gear
②Gear Bracket Ass'y
⑭FL Start Switch

Fig.12-2-3. **Gear Bracket Ass'y**

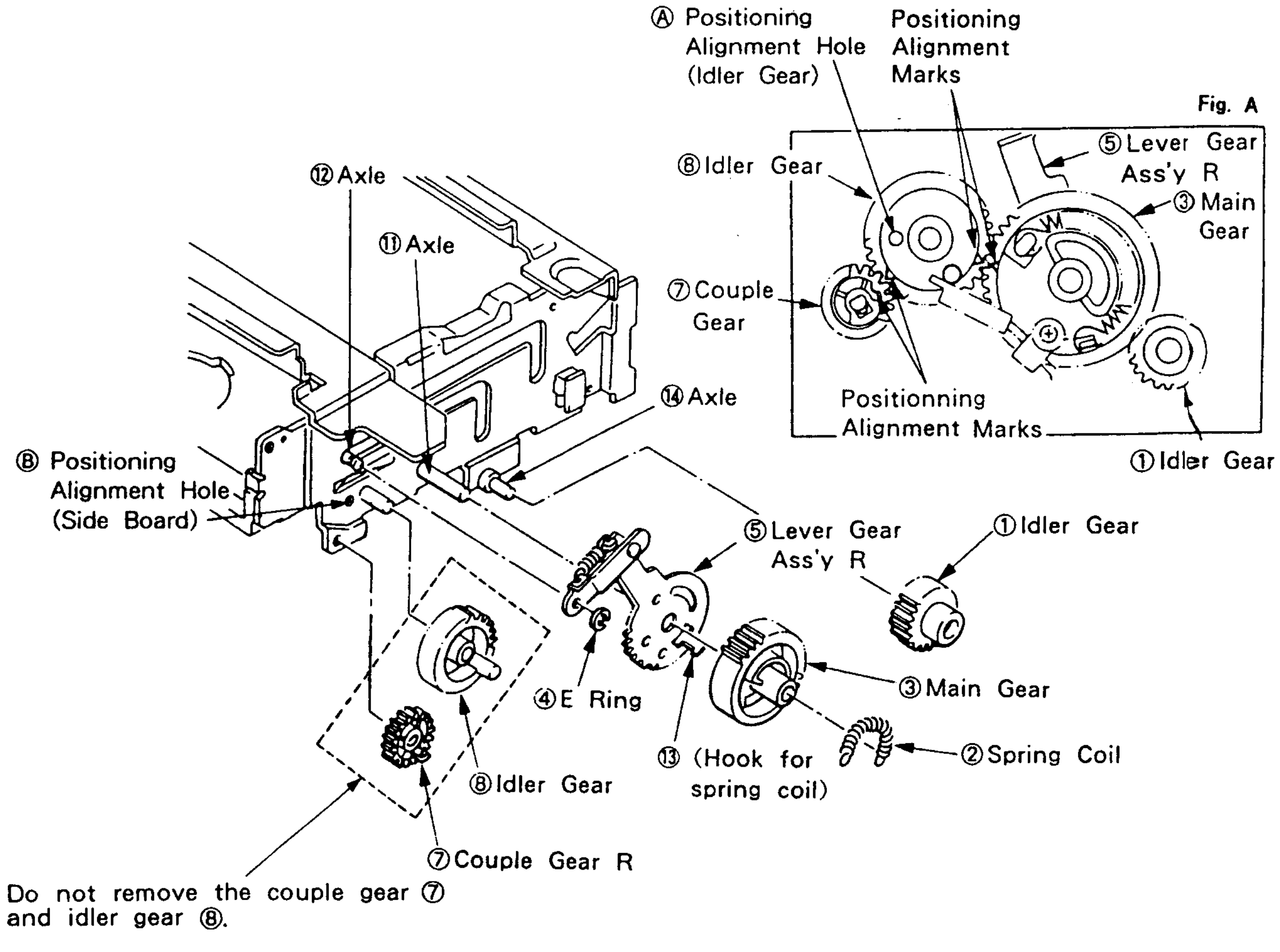
(3) CASSETTE DRIVE GEAR (RIGHT) (See Fig. 12-2-4.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM and the GEAR BRACKET ASS'Y as instructed in P.154 and P.153, respectively.
2) Remove the IDLER GEAR ①.
3) Remove the SPRING COIL ②, then remove the MAIN GEAR ③.
4) Remove the E ring ④, then remove the LEVER GEAR ASS'Y R ⑤.

2. Remounting

1) Apply grease to gear parts that undergo friction.
2) Align the positioning alignment hole Ⓐ of IDLER GEAR ⑧ with the positioning alignment hole Ⓑ of SIDE BOARD.
3) Mount the LEVER GEAR ASS'Y R ⑤ onto the axles ⑪ and ⑫. Align with the IDLER GEAR ⑧ as shown in Fig. A.
4) Mount the E ring ④ onto the axle ⑫.
5) Mount the MAIN GEAR ③ onto the axle ⑪. When doing so, align with the IDLER GEAR ⑧ as shown in Fig. A.
6) Hook the SPRING COIL ② to the notch ⑬ in the MAIN GEAR ③ and the LEVER GEAR ASS'Y R.
7) Mount the IDLER GEAR ① onto the axle ⑭. When doing so, align with the MAIN GEAR as shown in Fig. A.
8) Mount the GEAR BRACKET ASS'Y and the COMPL CASSETTE MECHANISM as instructed in P.154 and P.153, respectively.


Ⓐ Positioning Alignment Hole (Idler Gear)
Positioning Alignment Marks
Fig. A
⑧ Idler Gear
⑤ Lever Gear Ass'y R
③ Main Gear
⑦ Couple Gear
⑭ Axle
Positionning Alignment Marks
① Idler Gear
⑫ Axle
⑪ Axle
Ⓑ Positioning Alignment Hole (Side Board)
⑤ Lever Gear Ass'y R
① Idler Gear
④ E Ring
③ Main Gear
⑬ (Hook for spring coil)
② Spring Coil
⑧ Idler Gear
⑦ Couple Gear R

Do not remove the couple gear ⑦ and idler gear ⑧.

Fig.12-2-4. **Cassette Drive Gears (Right Side)**

(4) CASSETTE DRIVE GEAR (LEFT) (See Fig. 12-2-5.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the E ring ②.
3) Open the hook ③, then remove the LEVER GEAR ASS'Y L ④. Take care not to open the hook ③ too much, otherwise it may get deformed or broken. If it does, replace it.
4) Remove the SPRING COIL ⑤ from the LEVER GEAR ASS'Y L ④.

2. Remounting

1) Apply grease to the axle ⑨ and shaft ⑩.
2) Align with the COUPLE GEAR L ⑬ and the IDLER GEAR L ⑥ as shown in Fig B.
3) Hook the SPRING COIL ⑤ to the LEVER GEAR ASS'Y L ④.
4) Mount the LEVER GEAR ASS'Y L ④ onto the axle ⑨ and the shaft ⑩. Align with the IDLER GEAR L ⑥ as shown in Fig. B.
5) Mount the COMPL CASSETTE MECHANISM onto the chassis as instructed in P.153.

Note: The end of the DOOR OPEN LEVER ⑦ leans against the front side of the CASSETTE DOOR ⑪ as shown in Fig. A.

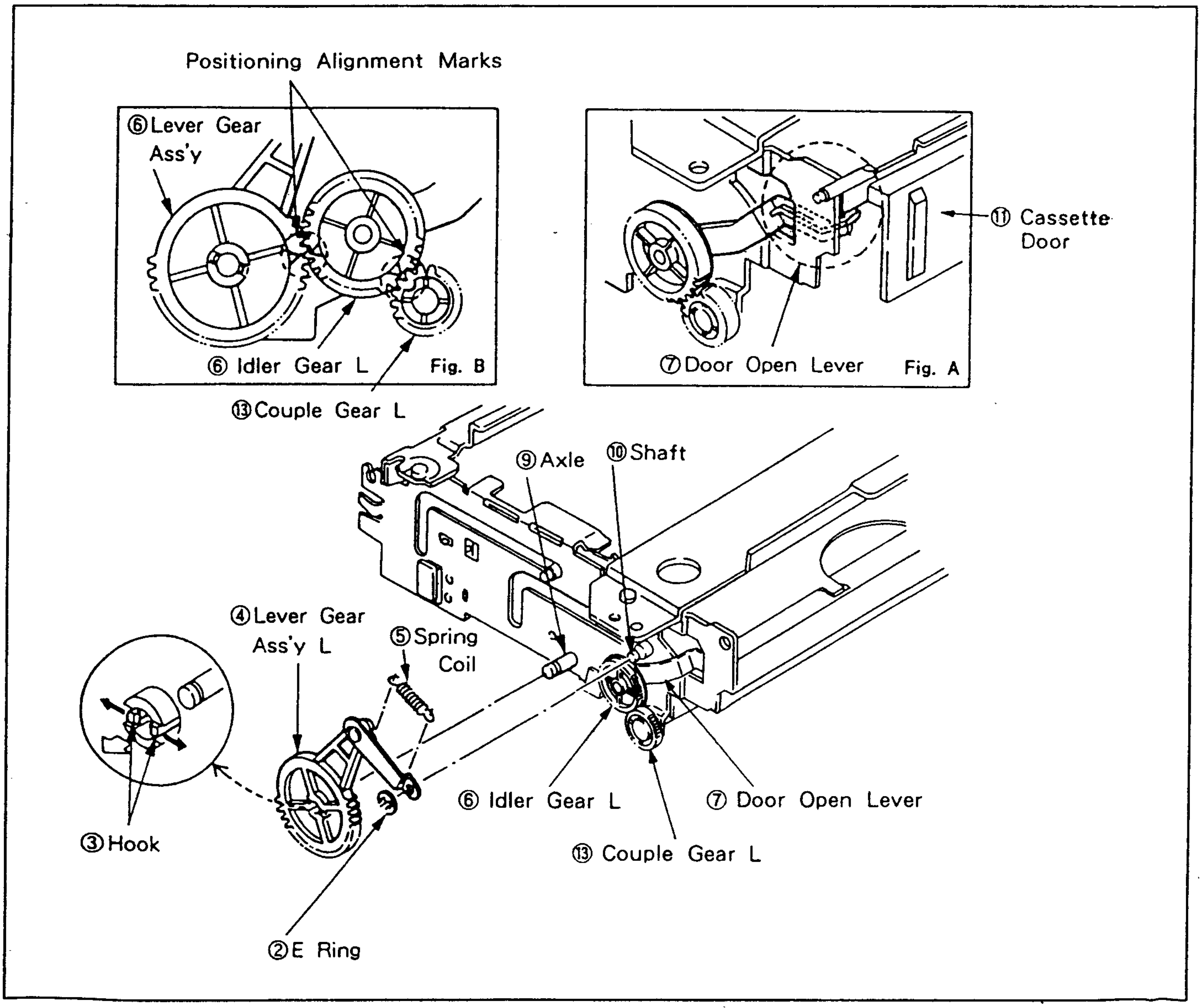

Positioning Alignment Marks
⑥Lever Gear Ass'y
⑥ Idler Gear L
Fig. B
⑬Couple Gear L
⑪ Cassette Door
⑦Door Open Lever
Fig. A
⑨Axle
⑩Shaft
④Lever Gear Ass'y L
⑤Spring Coil
③Hook
⑥ Idler Gear L
⑦ Door Open Lever
⑬ Couple Gear L
②E Ring

Fig.12-2-5. **Cassette Drive Gears (Left Side)**

(5) FL START SWITCH (See Fig. 12-2-6.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the screw ①.
3) Remove the lead wire of the FL START SWITCH ②.

2. Remounting

1) Solder the lead wire to the FL START SWITCH ② terminal.
2) Align the FL START SWITCH ② protuberance to the hole ⑤, then mount it onto the GEAR BRACKET ASS'Y ③ with the screw ①. Do it so that the FL START SWITCH ② is turned ON by holding the pin ④ of IDLER GEAR in the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.

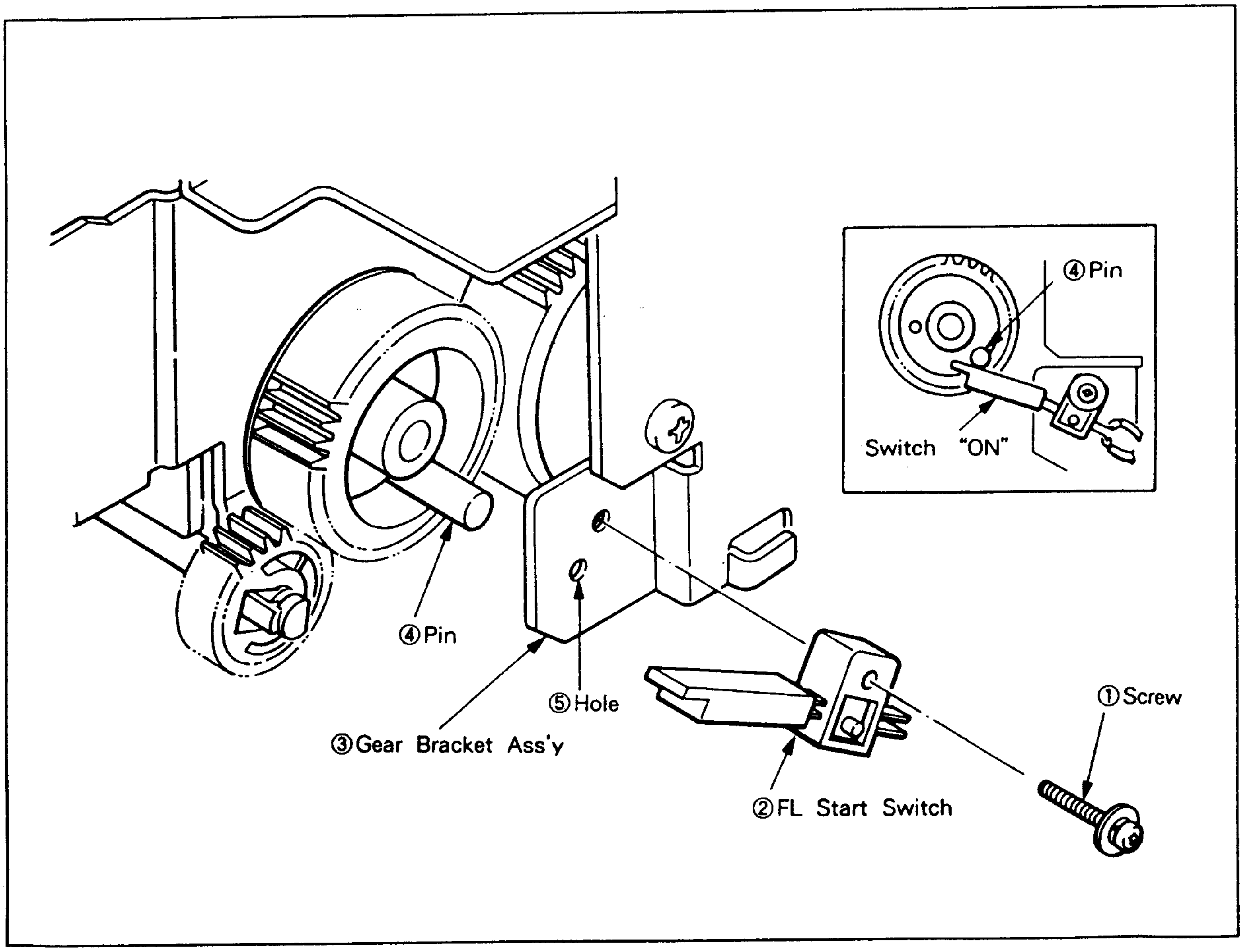

④Pin
Switch "ON"
④Pin
⑤Hole
③Gear Bracket Ass'y
①Screw
②FL Start Switch

Fig.12-2-6. **FL Start Switch**

(6) T-TOP SENSOR, T-END SENSOR (See Fig. 12-2-7.)

1. Removal

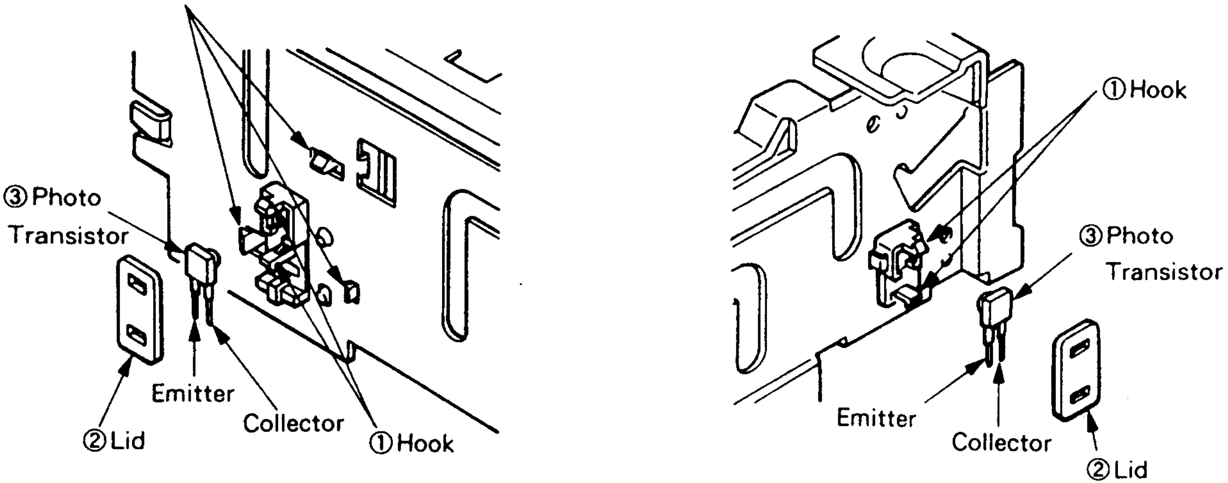
1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) When removing the T-TOP SENSOR, remove the GEAR BRACKET ASS'Y as instructed in P.154.
3) Unhook the hook ① as instructed in Fig. A, then remove the LID ②. Take care not to push the hook ① too much, otherwise it may be deformed or broken.
4) Remove the photo transistors ③, then remove the lead wires.

Note: Mounting position of the transistor holder on the T-END SENSOR side is precisely adjusted at the factory, so never remove it from the COMPL CASSETTE MECHANISM.

2. Remounting

1) Solder the brown lead wire to the emitter side, and the red lead wire to the collector side of the T-TOP SENSOR photo transistor ③.
   Solder the orange lead wire to the emitter side, and the yellow lead wire to the collector side of the T-END SENSOR photo transistor.
2) Mount the photo transistors ③ onto their respective holders.
3) Mount the LID ② and fix it with the hook ①.
4) Mount the GEAR BRACKET ASS'Y as instructed in P.154.
5) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.

Do not remove the holder from the compl cassette mechanism.



(T • END Sensor)

(T • TOP Sensor)

Fig. A

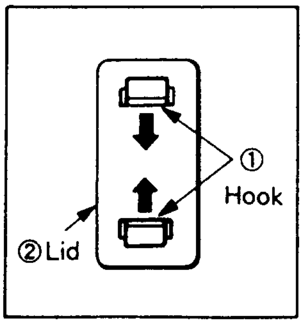


Fig.12-2-7. **T TOP Sensor & T END Sensor**

12-2-4. COMPL HOLDER MOTOR (LOADING MOTOR BLOCK)

(1) COMPL Motor Bracket

1. Removal

1) Remove the PRE-AMP UNIT and the PRE-AMP. BRACKET as instructed in Fig. 12-2-1.
2) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
3) Remove the two screws ① and the other one ⑩, then remove the COMPL HOLDER MOTOR ② (see Fig.12-2-8.)

2. Remounting

1) Set the mechanism chassis to the INITIAL mode. In this mode, look at the mechanism chassis INITIAL mode positioning alignment holes ③ just from above and align the MAIN CAM ④ and MODE CAM ⑤ INITIAL mode positioning alignment holes as shown in Fig. A.
2) Set the COMPL HOLDER MOTOR ② to the INITIAIL mode with the mode selector (VHJ-0050). In this position, the FRONT LOADING GEAR △ positioning alignment mark ⑥ is aligned with the MOTOR HOLDER INITAL mode positioning alignment mark ⑦ (see Fig. B.).
3) Align the ROTARY SWITCH (mode detector switch) ⑧ with the INITIAL mode positioning alignment mark ⑨ (see Fig. C.).
4) Line up COMPL HOLDER MOTOR ② with PROTUBERANCE ⑪ and POSITIONING ALIGNMENT HOLE ⑫, and attach with two screws ① and one screw. (Refer to Fig.12-2-8.)
5) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.
6) Mount the PRE-AMP UNIT and the PRE-AMP. BRACKET as instructed in Fig.12-2-1.

Note: Normal mechanism operation cannot be achieved if initial positioning of the MAIN CAM ④, the MODE CAM ⑤ and the ROTARY SWITCH (mode detector switch) ⑧ are not performed precisely.

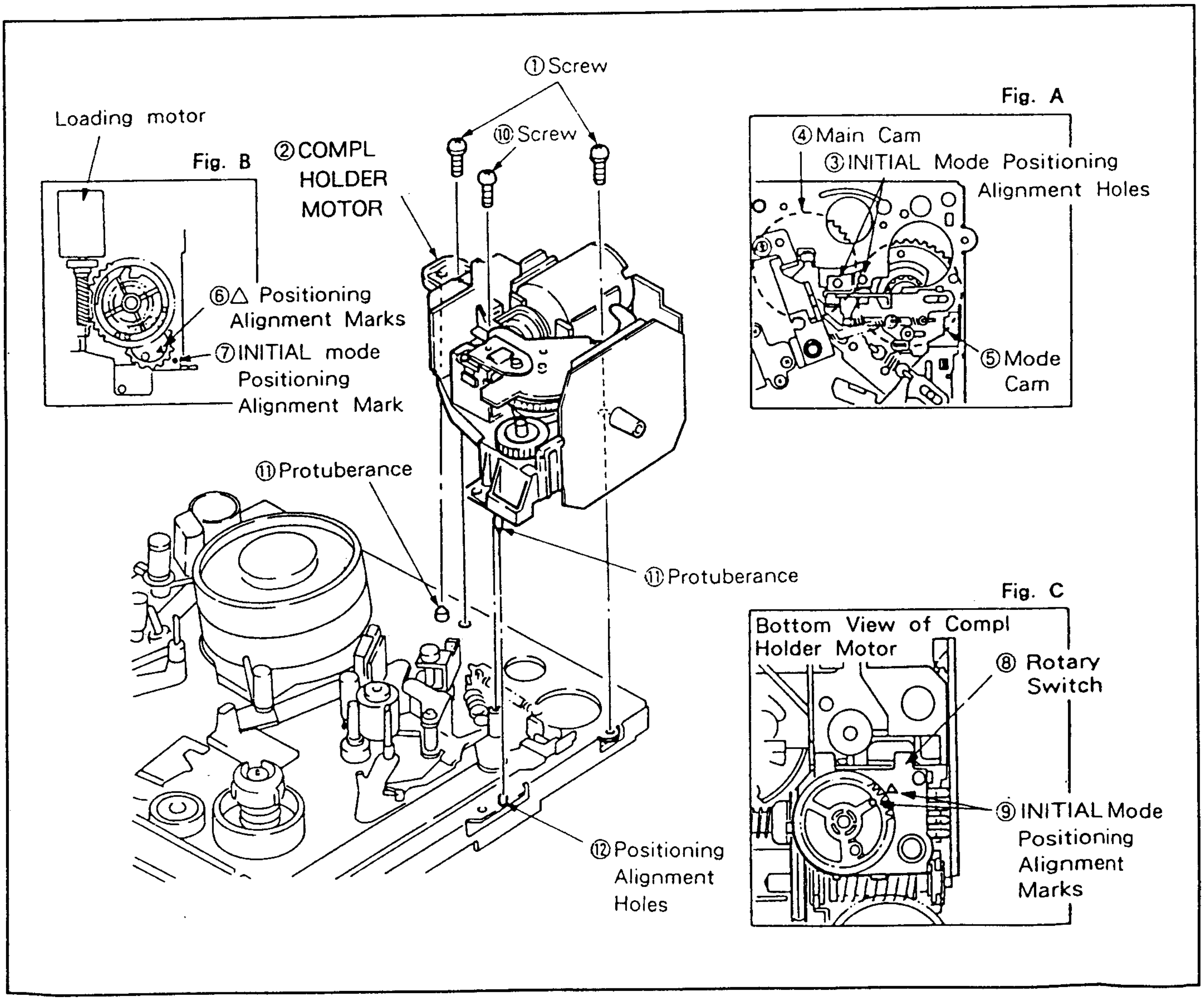

①Screw
Loading motor
Fig. B
②COMPL HOLDER MOTOR
⑩Screw
Fig. A
④Main Cam
③INITIAL Mode Positioning Alignment Holes
⑥△ Positioning Alignment Marks
⑦INITIAL mode Positioning Alignment Mark
⑤Mode Cam
⑪Protuberance
⑪Protuberance
Fig. C
Bottom View of Compl Holder Motor
⑧ Rotary Switch
⑨ INITIAL Mode Positioning Alignment Marks
⑫Positioning Alignment Holes

Fig.12-2-8. **Compl Holder Motor**

(2) LOADING MOTOR (Refer to Fig. 12-2-9.)

1. Removal

LOADING MOTOR can be replaced after LOADING MOTOR BLOCK unit has been removed by referring to 12-2-4. The 1991 version of the mechanism allows LOADING MOTOR itself to be replaced without removing CASSETTE HOLDER BLOCK and LOADING MOTOR BLOCK. The following describes this procedure.

1) Use MODE SELECTOR (VHJ-0050) to set the mechanism to the INITIAL mode.
2) Remove the connector for DEW SENSOR connected to the MC-3 board ①.
3) Remove the three screws ② and remove the HOLDER BRACKET ④ with the FRONT WORM ASS'Y ③ still attached.
4) Remove the DAMPER ⑥ attached to the pulley of the LOADING MOTOR ⑤.
5) Remove the FRONT HELICAL GEAR ⑦ and WASHER ⑧.
6) Remove soldered LEAD WIRE from the terminal of LOADING MOTOR ⑤.
7) Remove the LOADING BELT ⑨.
8) Remove the LOADING MOTOR ⑤ by lifting up from the back terminal side.

2. Remounting

Before attaching the LOADING MOTOR ⑤ to the MOTOR HOLDER ⑩, confirm the DAMPER ⑪ and DAMPER ⑫ shown in Fig. 12-2-9. are in the proper position on MOTOR HOLDER ⑩.

1) The LOADING MOTOR ⑤ puts PROTUBERANCE ㉓ in the slit ㉔ of the MOTOR HOLDER ⑩. Further, mount the tap hole ⑬ at two points of the front pulley side so that the it is secured to the PROTUBERANCE ⑭ of the MOTOR HOLDER at two points.
2) Solder the lead wire from the MC-3 board to the LOADING MOTOR ⑤ terminal. (Solder the red lead wire to the positive terminal side.)
3) Hang the LOADING BELT ⑨ on the pulley.
4) After hanging the LOADING BELT ⑨ on the pulley, confirm that the mechanism unit is in the INITIAL mode. The initial mode is indicated by Fig. A of Fig. 12-2-9., and is the position in which INITIAL mode positioning alignment holes of the MAIN CAM ⑮ and MODE CAM ⑯ are lined up with the THROUGH HOLE ⑰ of the MOTOR HOLDER. If the INITIAL mode is not selected, adjust with MODE SELECTOR (VHJ-0050).
5) As shown in Fig. B, confirm the positions of the △ INITIAL positioning alignment mark on the FRONT LOAD GEAR ⑱ and INITIAL mode positioning alignment mark ⑲ position of the MOTOR HOLDER and the position relationship of the RACK ⑳.
6) Apply a light coat of grease to the entire sides of the AXLE ㉑ and FRONT HELICAL GEAR ⑦.
7) Attach the FRONT HELICAL GEAR ⑦ and WASHER ⑧ to the AXLE ㉑. As shown in Fig. C, the FRONT HELICAL GEAR ⑦ is attached so that the indent on the side is inside PIN ㉒ of the FRONT LEVER ASS'Y.
8) Attach the DAMPER ⑥ to the LOADING MOTOR ⑤ pulley.
9) The HOLDER BRACKET ④ is attached by engaging the FRONT WORM ASS'Y ③ with the LOADING MOTOR ⑤ pulley, and held in place with three screws ②.
10) Attach the connector of DEW SENSOR ㉕ to the MC-3 board ① and return the mechanism to the eject completion using MODE SELECTOR.

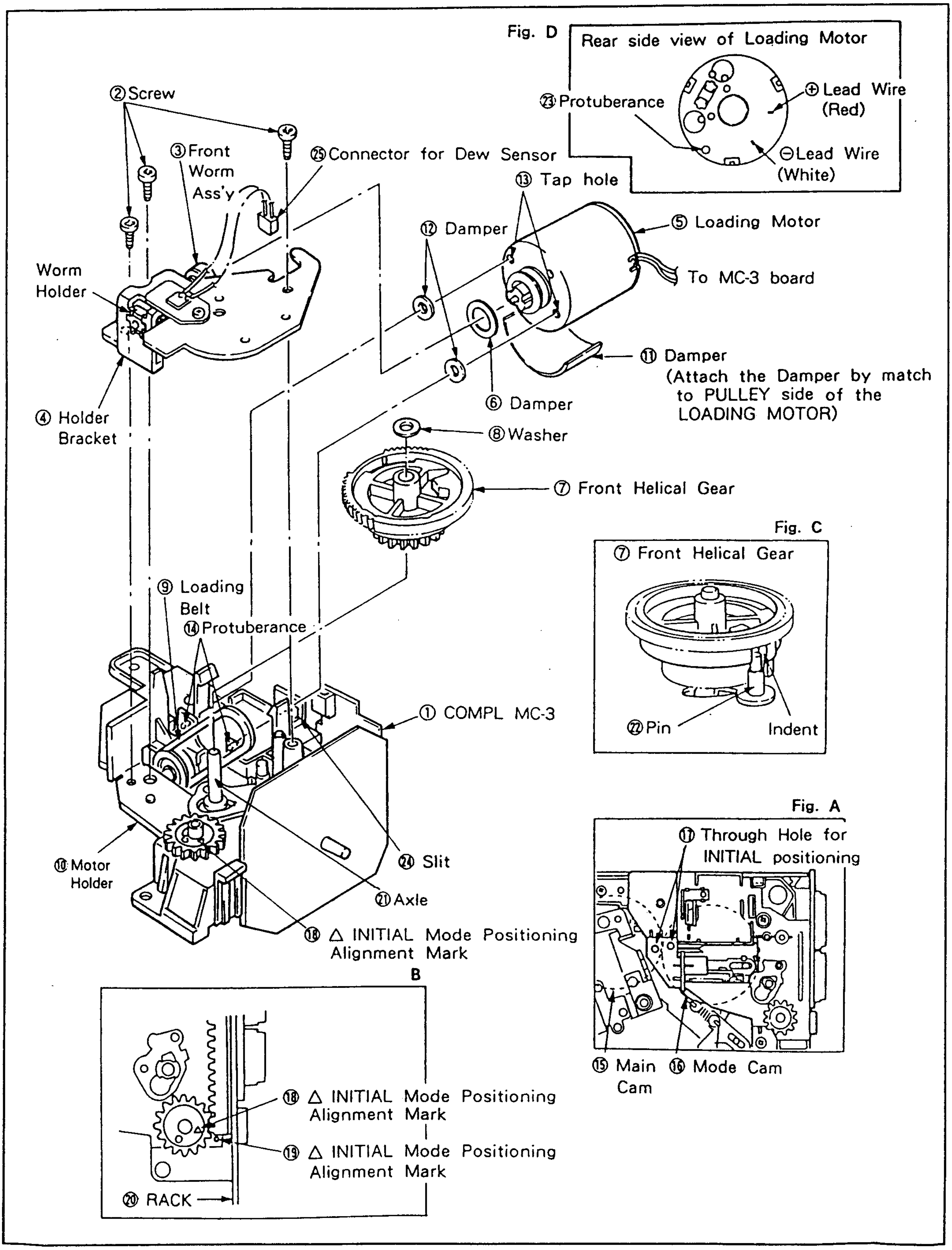


Fig. D
Rear side view of Loading Motor
㉓ Protuberance
⊕ Lead Wire (Red)
⊖ Lead Wire (White)
② Screw
③ Front Worm Ass'y
㉕ Connector for Dew Sensor
⑬ Tap hole
⑫ Damper
⑤ Loading Motor
To MC-3 board
Worm Holder
⑪ Damper
(Attach the Damper by match to PULLEY side of the LOADING MOTOR)
④ Holder Bracket
⑥ Damper
⑧ Washer
⑦ Front Helical Gear
Fig. C
⑦ Front Helical Gear
㉒ Pin
Indent
⑨ Loading Belt
⑭ Protuberance
① COMPL MC-3
Fig. A
⑰ Through Hole for INITIAL positioning
⑩ Motor Holder
㉔ Slit
㉑ Axle
⑱ △ INITIAL Mode Positioning Alignment Mark
B
⑮ Main Cam
⑯ Mode Cam
⑱ △ INITIAL Mode Positioning Alignment Mark
⑲ △ INITIAL Mode Positioning Alignment Mark
⑳ RACK

Fig.12-2-9. Loading Motor

12-2-5. TAPE LOADING MECHANISM

(1) MAIN PARTS OF THE TAPE LOADING MECHANISM (See Fig. 12-2-10.)

1. Removal

1) Remove connectors from the DRUM MOTOR board (SV-5).
2) Remove the three screws ①, then remove the REINFORCE BRACKET ②.
3) Remove the two special washers ③, then remove the LOAD RACK ④.
4) Remove the special washer ⑤, then remove the CAM LOAD LEVER ASS'Y ⑥.
5) Remove the special washer ⑦, then remove the MAIN CAM ⑧.
6) Unhook the LOAD GEAR T hook ⑩, then remove the LOAD GEAR T ⑨ as shown in Fig. A, with the SPRING COIL ⑪ and the LOAD LEVER ASS'Y T ⑫ attached to it.
7) Unhook the LOAD GEAR S hook ⑭, then remove the LOAD GEAR S ⑬ as shown in Fig. B, with the SPRING COIL ⑮ and the LOAD LEVER ASS'Y S ⑯ attached to it.

Note: Take care not to open the LOAD GEAR hooks too much, otherwise they may be deformed or broken. If they are, replace them.

2. Remounting

1) Apply grease to the hole ⑰ of the LOAD LEVER ASS'Y S ⑯, as shown in Fig. B.
2) Apply grease to the hole ㉒ of the LOAD LEVER ASS'Y T ⑫ as shown in Fig. A, and to the sections of the LOAD GEAR T ⑨ as indicated with an arrow in Fig. C.
3) Apply grease to GROOVE 1, GROOVE 2 and to the outer side of the MAIN CAM ⑧, shown in Fig. E.
4) Apply grease to the three oval holes of the LOAD RACK ④ as shown in Fig. D.
5) Apply grease to the outer surface of axles ⑲, ⑳, ㉖ and ㉘.
6) After assembling as shown in Fig. B, mount the LOAD GEAR S ⑬ onto the axle ⑲. Insert the ROLLER BASE S pin ⑱ into the hole ⑰ of the LOAD LEVER ASS'Y S.
7) After assembling as shown in Fig. A, mount the LOAD GEAR T ⑨ onto the axle ⑳. When doing so, align the INITIAL mode positioning alignment holes ㉑ of the LOAD GEAR S ⑬ and the LOAD GEAR T ⑨ to the INITIAL mode position. Insert the ROLLER BASE T pin ㉓ into the hole ㉒ of the LOAD LEVER ASS'Y T ⑫.
8) Mount the MAIN CAM ⑧ onto the axle ㉖. At that time, make sure that the INITIAL mode positioning alignment holes ㉕ of the MAIN CAM ⑧ and the MODE CAM ㉔ match the INITIAL mode positioning alignment holes ㉞ of the MECHANISM CHASSIS. Also check to be sure that the pin ㉗ of the CAM PINCH LEVER ASS'Y is put in the GROOVE 1 of the MAIN CAM as shown in Fig. E.
9) Mount the special washer ⑦ onto the axle ㉖.
10) Mount the CAM LOAD LEVER ASS'Y ⑥ onto the axle ㉘. Insert the pin ㉙ into the MAIN CAM GROOVE 2 as shown in Fig. E.
11) Mount the special washer ⑤ onto the axle ㉘.
12) Set the INITIAL mode positioning alignment marks ㉚ of the LOAD RACK ④ and the LOAD GEAR T ⑨ to the INITIAL mode position, and mount onto the two axles ㉛. Insert the CAM LOAD LEVER ASS'Y pin ㉝ into the hole ㉜.
13) Mount the two special washers ③ onto the two axles ㉛.
14) Mount the REINFORCE BRACKET ② with the three screws ①.
15) Insert the connector into the DRUM MOTOR board (SV-5).
16) Confirm that loading and unloading are performed smoothly.

Note: Be sure to perform INITIAL mode positioning of cams and gears precisely.

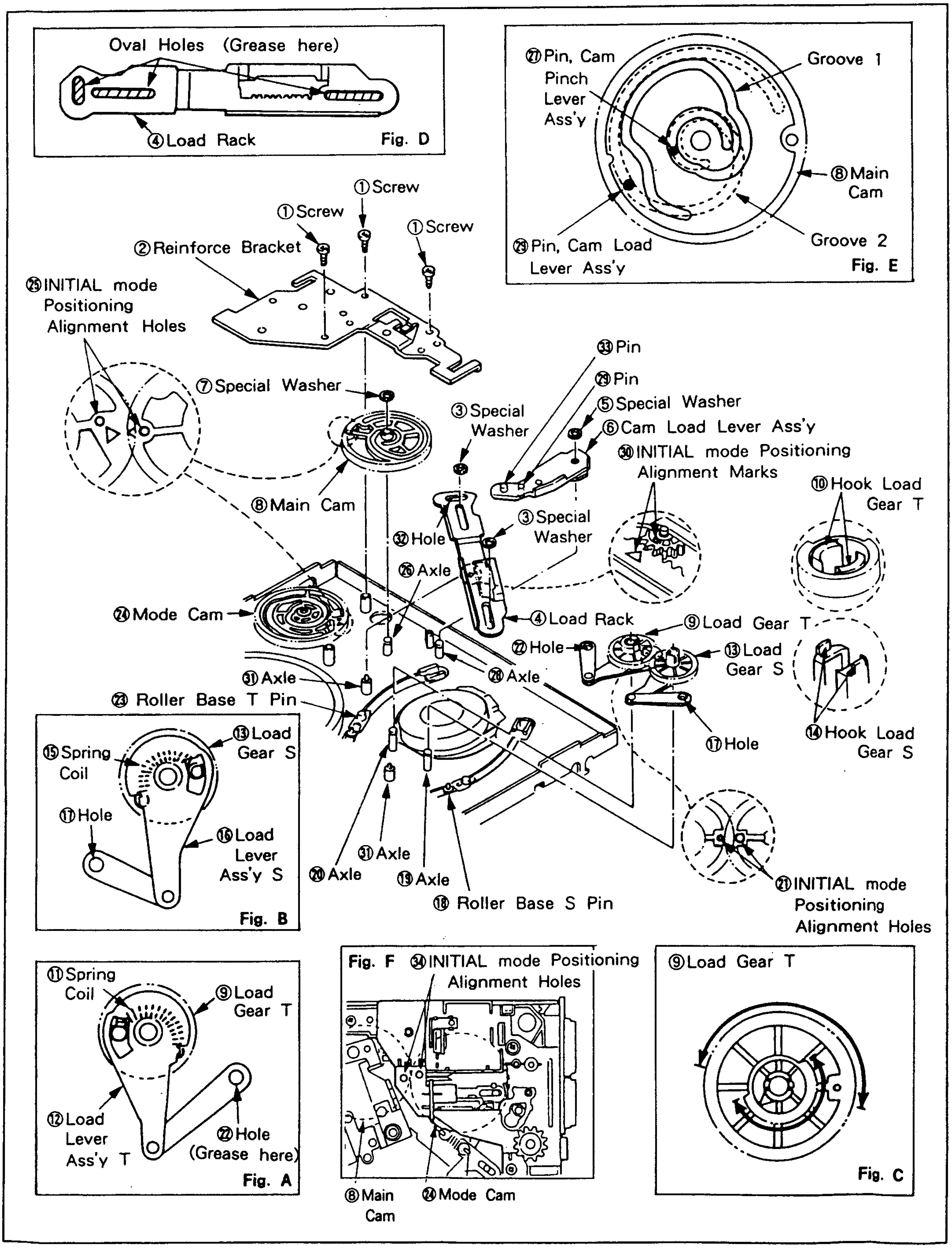

Oval Holes (Grease here)
④Load Rack
Fig. D
㉗Pin, Cam Pinch Lever Ass'y
Groove 1
⑧Main Cam
Groove 2
㉙Pin, Cam Load Lever Ass'y
Fig. E
①Screw
①Screw
①Screw
②Reinforce Bracket
㉕INITIAL mode Positioning Alignment Holes
⑦Special Washer
⑧Main Cam
③Special Washer
㉝Pin
㉙Pin
⑤Special Washer
⑥Cam Load Lever Ass'y
㉚INITIAL mode Positioning Alignment Marks
⑩Hook Load Gear T
㉜Hole
㉖Axle
③Special Washer
㉔Mode Cam
④Load Rack
⑨Load Gear T
㉒Hole
⑬Load Gear S
㉘Axle
㉛Axle
㉓ Roller Base T Pin
⑰Hole
⑭Hook Load Gear S
㉛Axle
⑳Axle
⑲Axle
⑱ Roller Base S Pin
㉑INITIAL mode Positioning Alignment Holes
⑮Spring Coil
⑬Load Gear S
⑰Hole
⑯Load Lever Ass'y S
Fig. B
⑪Spring Coil
⑨Load Gear T
⑫Load Lever Ass'y T
㉒Hole (Grease here)
Fig. A
Fig. F ㉞INITIAL mode Positioning Alignment Holes
⑧Main Cam
㉔Mode Cam
⑨Load Gear T
Fig. C

Fig.12-2-10. Loading Mechanism Main Parts

(2) MODE CAM (See Fig. 12-2-11.)

1. Removal

1) Set the INITIAL mode with the mode selector (VHJ-0050).
2) Remove the REINFORCE BRACKET as instructed in P.163.
3) Remove the two special washers ①, then remove the CAM PLATE SLIDE ASS'Y ②.
4) Remove the MODE CAM ③.

2. Remounting

1) Referring to P.163, confirm that the MAIN CAM is in the INITIAL mode position.
2) In case the MAIN CAM is misplaced, use the mode selector (VHJ-0050) to align the MAIN CAM positioning hole with the chassis INITIAL mode position hole (refer to P.163 for the INITIAL mode position). Since the ROTARY SWITCH (mode detector switch) does not rotate, the mode selector indicator lamp will not show the correct mode.
3) Align the ROTARY SWITCH (mode detector switch) ④ with the INITIAL mode positioning alignment mark ⑤ as shown in Fig. A.
4) Mount the MODE CAM ③ onto the axle ⑥. Do it so that the SLIDE CAM ASS'Y pin ⑪ is placed in the GROOVE 3 as shown in Fig. B.
5) Mount the CAM PLATE SLIDE ASS'Y ② onto the axles ⑥ and ⑦. Do it so that the pin ⑧ gets into the GROOVE 4 of the MODE CAM as shown in Fig. B, and the point of the bent-up part ⑨ into the ACT PLATE SLIDE ASS'Y hole ⑩.
6) Mount the two special washers ① onto the axles ⑥ and ⑦.
7) Mount the REINFORCE BRACKET as instructed in P.163.

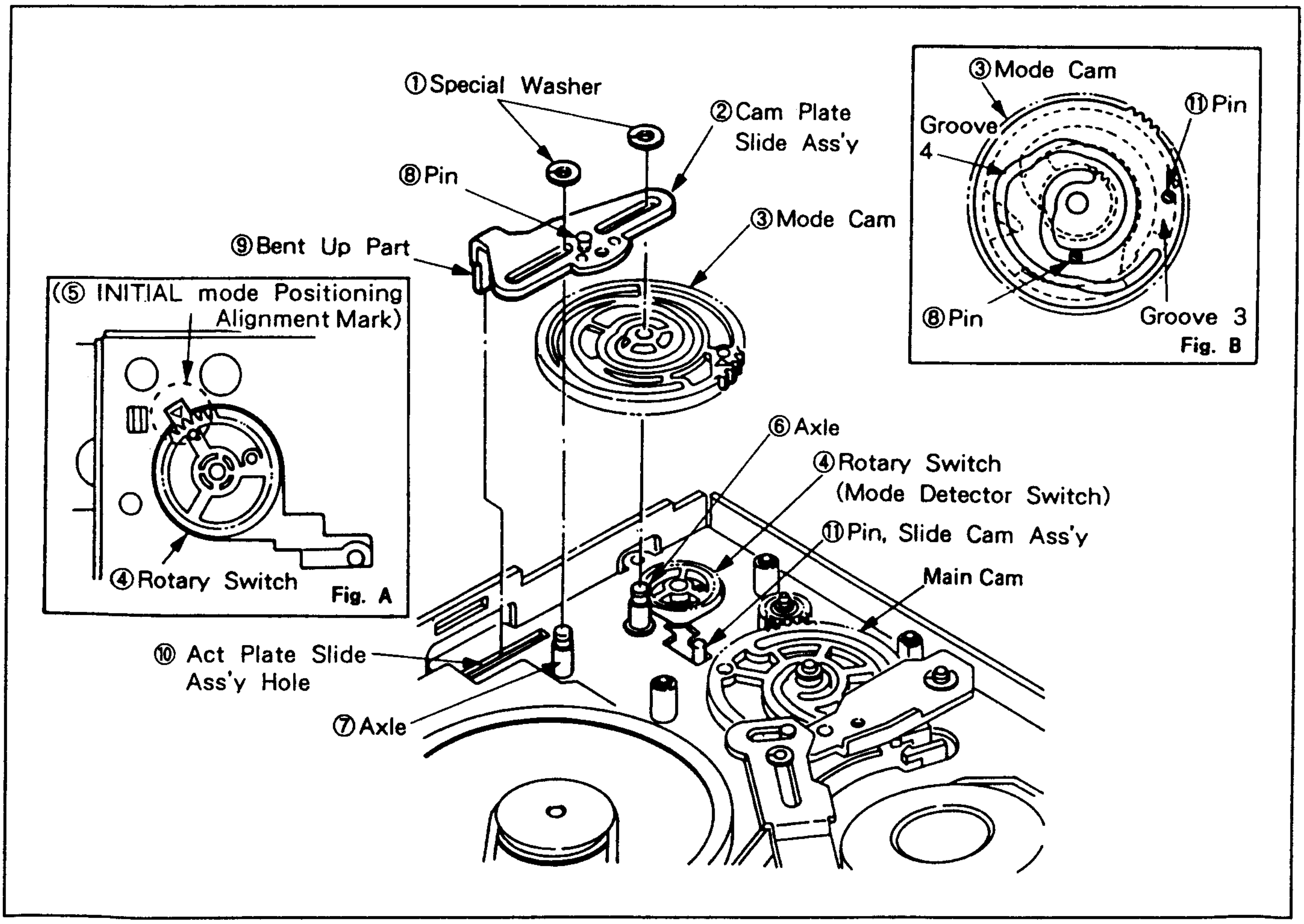

①Special Washer
②Cam Plate Slide Ass'y
⑧Pin
③Mode Cam
⑨Bent Up Part
(⑤ INITIAL mode Positioning Alignment Mark)
④Rotary Switch
Fig. A
③Mode Cam
Groove 4
⑪Pin
⑧Pin
Groove 3
Fig. B
⑥Axle
④Rotary Switch (Mode Detector Switch)
⑪Pin, Slide Cam Ass'y
Main Cam
⑩ Act Plate Slide Ass'y Hole
⑦Axle

Fig.12-2-11. Mode Cam

12-2-6. COMPL HEAD BRACKET (ACE HEAD) (See Fig. 12-2-12.)

1. Removal

1) Remove the special nut ②.
2) Remove the SLEEVE ③, the COMPL HEAD BRACKET ① and the SPRING COIL ④, in that order.

Note: Take care not to scratch or soil the ACE head surface.

2. Remounting

1) Apply grease to the axle ⑥ as shown in Fig. A.
2) Apply grease to the spot where the COMPL HEAD BRACKET ① makes contact with the STOPPER ⑦.
3) Mount the SPRING COIL ④ and the COMPL HEAD BRACKET ①, in that order, onto the axle ⑥. Hook one end of the SPRING COIL ④ to the notch ⑤, and the other end to the COMPL HEAD BRACKET, so that the COMPL HEAD BRACKET is pressed against the STOPPER ⑦.
4) Mount the special nut ② onto the axle ⑥ through the SLEEVE ③.
5) Clean the ACE head surface with a chamois leather moistened with methyl alcohol.
6) Perform ACE head adjustment as instructed in 12-3-4 (P.195).

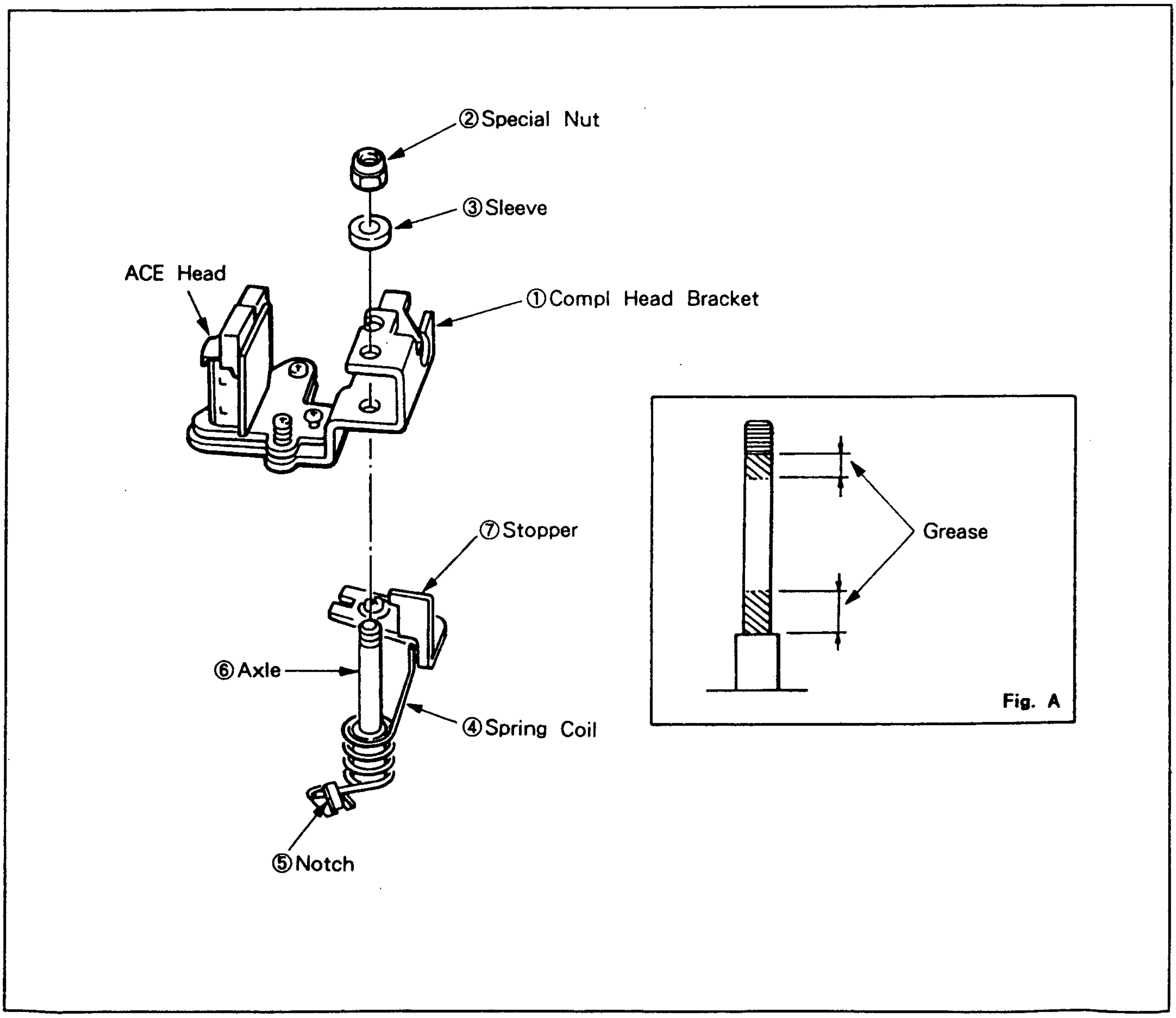

②Special Nut
③Sleeve
ACE Head
①Compl Head Bracket
⑦Stopper
⑥Axle
④Spring Coil
⑤Notch
Grease
Fig. A

Fig.12-2-12. **Compl Head Bracket (ACE Head)**

12-2-7. PINCH ROLLER PRESSURE MECHANISM (See Fig. 12-2-13.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the COMPL HEAD BRACKET as instructed in 12-2-6.
3) Remove the PINCH SPRING COIL ①.
4) Remove the special washer ②, then remove the PINCH LEVER ASS'Y ③.
5) Remove the REV GUIDE LEVER SPRING COIL ④.
6) Remove REV GUIDE LEVER ASS'Y ⑥ from the hook ⑤ of the plastic bearing on the bottom side. Use a jig VHJ-0073 shown in Fig. 12-2-14. to widen the hook of the plastic bearing. By so doing, the above removal of the REV GUIDE LEVER ASS'Y ⑥ can be made more easily. Care should be taken to avoid pushing the jig VHJ-0073 too much. Pushing it too hard may damage the hook in an extreme case.
7) Remove the SLIDE BRAKE SPRING COIL ⑦.
8) Remove the special washer ⑧, then remove the PINCH CAM LEVER ASS'Y ⑨.
9) Remove the ACT PINCH SLIDE ASS'Y ⑩.

Note: If the hook ⑤ of the plastic bearing is damaged, reference should be made to Section 3. "Method of Repairing the Bearing Section of REV GUIDE LEVER ASS'Y".

2. Remounting

1) Apply grease to pins ⑫/⑬ and axles ⑯/⑱.
2) Apply grease to the ACT PINCH SLIDE ASS'Y pin ⑰.
3) Set the INITIAL mode with the mode selector (VHJ-0050).
4) Mount the ACT PINCH SLIDE ASS'Y ⑩ onto pins ⑫ and ⑬.
5) Insert the pin ⑭ of the PINCH CAM LEVER ASS'Y ⑨ into the MAIN CAM ⑪ GROOVE 1, and mount onto the axle ⑯ while inserting the ACT PINCH SLIDE ASS'Y pin ⑰ of the ACT PINCH SLIDE ASS'Y into the hole ⑮.
6) Mount the special washer ⑧ onto the axle ⑯.
7) Hook the SLIDE BRAKE SPRING COIL ⑦ to the plastic pin ⑲.
8) Mount the REV GUIDE LEVER ASS'Y ⑥ to the plastic molding bearing, then fix it with the hook ⑤ at the bottom.
9) Hook the REV GUIDE LEVER SPRING COIL ④.
10) Mount the PINCH LEVER ASS'Y ③ to the axle ⑱.
11) Mount the special washer ② to the axle ⑱.
12) Hook the PINCH SPRING COIL ① between the ACT PINCH SLIDE ASS'Y ⑩ and the PINCH LEVER ASS'Y ③.
13) Mount the COMPL HEAD BRACKET as instructed in 12-2-6.
14) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.
15) Perform ACE head adjustment as instructed in 12-3-4.

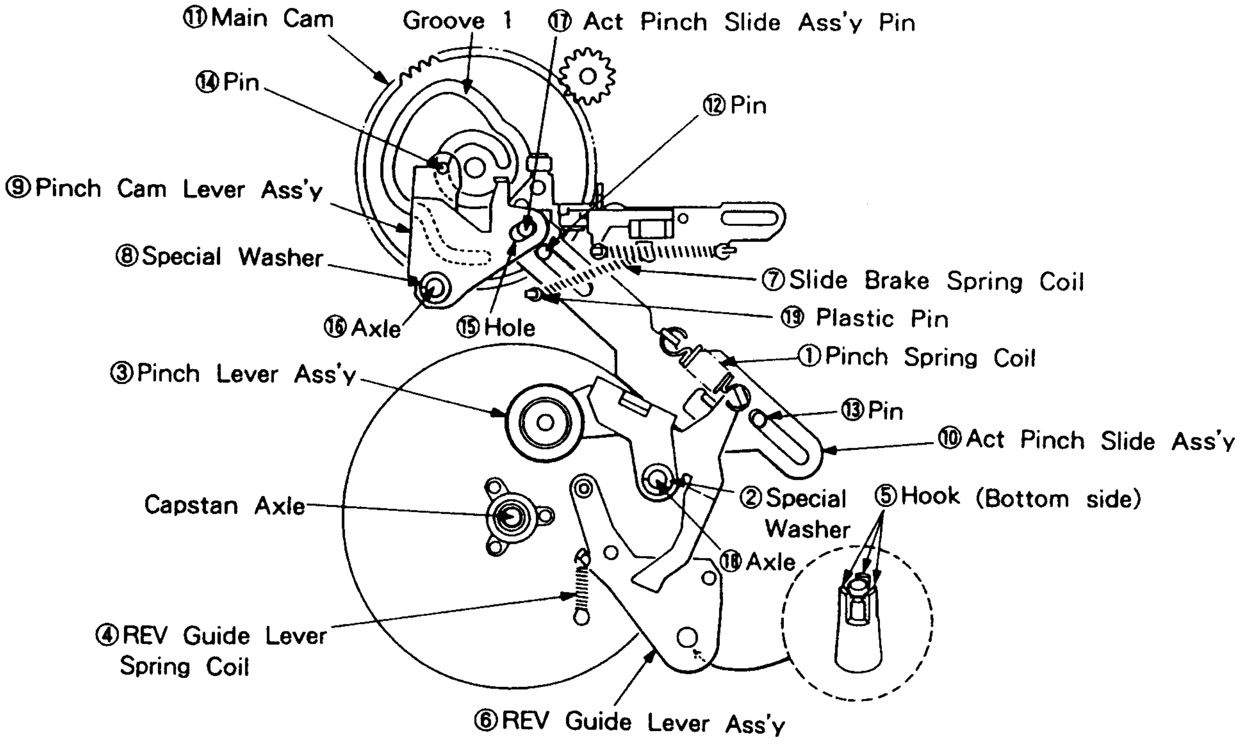
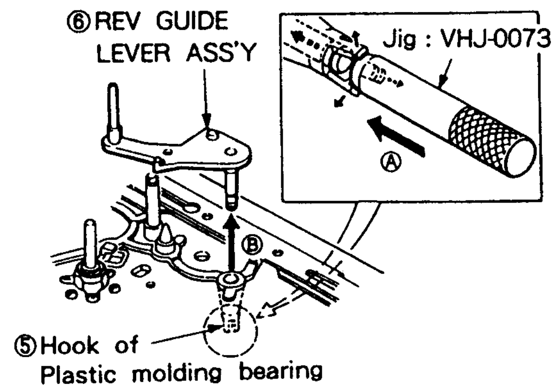

⑪Main Cam
Groove 1
⑰ Act Pinch Slide Ass'y Pin
⑭Pin
⑫Pin
⑨Pinch Cam Lever Ass'y
⑧Special Washer
⑦Slide Brake Spring Coil
⑲ Plastic Pin
⑯Axle
⑮Hole
①Pinch Spring Coil
③Pinch Lever Ass'y
⑬Pin
⑩Act Pinch Slide Ass'y
Capstan Axle
②Special Washer
⑤Hook (Bottom side)
⑱Axle
④REV Guide Lever Spring Coil
⑥REV Guide Lever Ass'y

Fig.12-2-13. **Pinch Roller Pressure Mechanism**


⑥REV GUIDE
LEVER ASS'Y
Jig : VHJ-0073
Ⓐ
Ⓑ
⑤Hook of
Plastic molding bearing

Remove REV GUIDE LEVER ASS'Y in the direction of arrow Ⓑ, pushing VHJ-0073 slightly in the direction of arrow Ⓐ.
Be careful not to damage the hook by pushing too much.

Fig.12-2-14. Method of Using the Jig VHJ-0073

3. Method of Repairing the Bearing Section of REV GUIDE LEVER ASS'Y

If the hook of the plastic molding bearing is damaged in the process of removing the REV GUIDE LEVER ASS'Y, proceed with the repair as follows :

1) Scrape the broken hook of the bearing section with a cutter knife and flatten it.
2) Insert the REV GUIDE LEVER ASS'Y in the bearing and fit a stopper washer in. The special washer to be used must be Part No. 411 109 1605. This special washer (part No. 411 109 1605) is the same as that used on SUPPLY REEL ASS'Y or TAKE-UP REEL ASS'Y.

Remove the REV GUIDE LEVER ASS'Y toward an arrow B while pushing the jig VHJ-0073 lightly in the direction of an arrow.
Pushing the jig VHJ-0073 too much may cause hook breakage. Therefore, care should be taken.

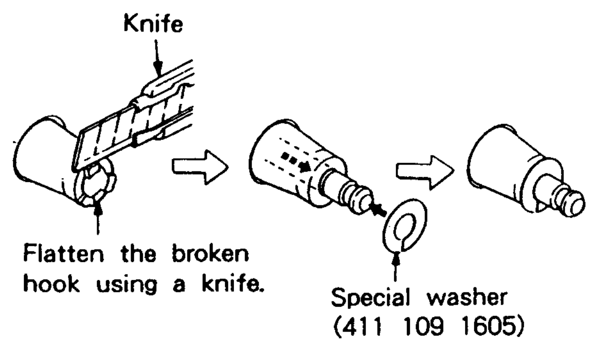

Knife
Flatten the broken
hook using a knife.
Special washer
(411 109 1605)

Fig.12-2-15. Method of Repairing the Bearing Section of the REV GUIDE LEVER ASSEMBLY

12-2-8. BRAKE MECHANISM

(1) SUB TAKE-UP BRAKE ASS'Y (See Fig. 12-2-16.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the SPRING COIL ①.
3) While pushing the hook ② in the direction of arrow, remove the SUB TAKE-UP BRAKE ASS'Y ③.

2. Remounting

1) Mount the SUB TAKE-UP BRAKE ASS'Y ③ onto the pin ④. Confirm that the hook ② is firmly hooked to the chassis.
2) Fit the SPRING COIL between hooks ⑤ and ⑥.
3) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.

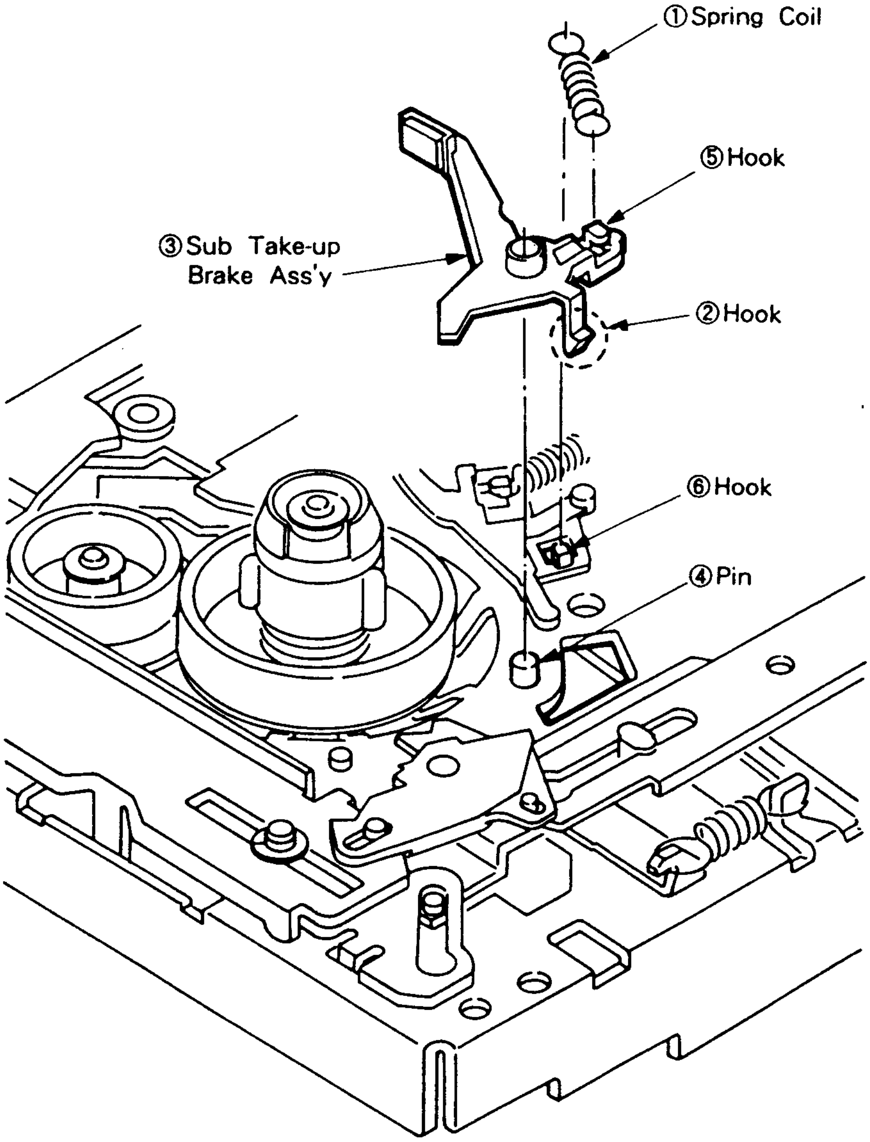

①Spring Coil
⑤Hook
③Sub Take-up Brake Ass'y
②Hook
⑥Hook
④Pin

Fig.12-2-16. Sub Take-up Brake Ass'y

(2) SUPPLY BRAKE ASS'Y AND TAKE-UP BRAKE ASS'Y (See Fig. 12-2-17.)

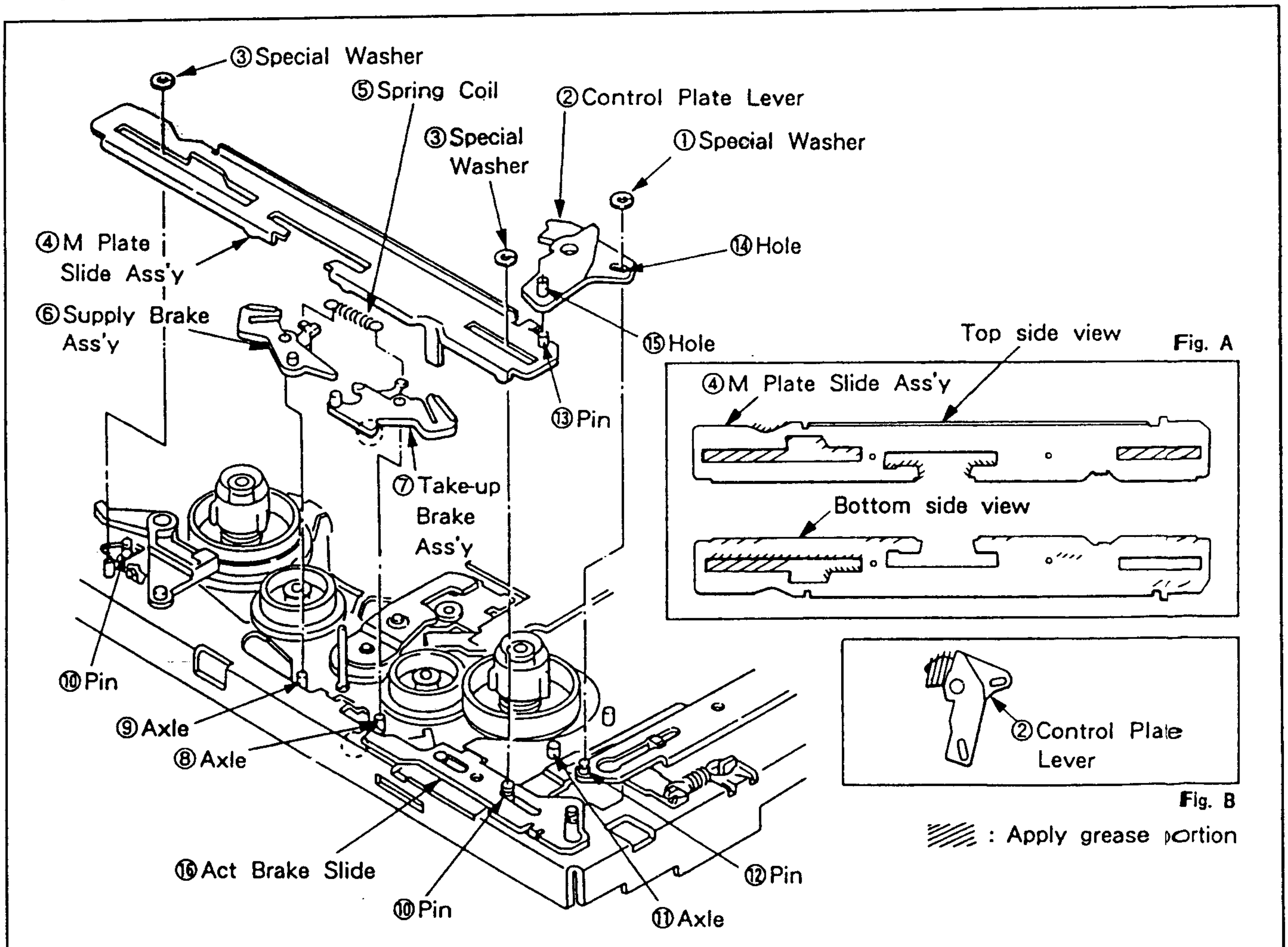
1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the SUB TAKE-UP BRAKE as instructed in P.168.
3) Remove the special washer ①, then remove the CONTROL PLATE LEVER ②.
4) Remove the two special washers ③, then remove the M PLATE SLIDE ASS'Y ④.
5) Remove the SPRING COIL ⑤.
6) Remove the SUPPLY BRAKE ASS'Y ⑥ and the TAKE-UP BRAKE ASS'Y ⑦.

Note: Take care not to soil the brake shoes.

2. Remounting

1) Apply a thin layer of grease to axles ⑧ and ⑨.
2) Mount the TAKE-UP BRAKE ASS'Y ⑦ onto the axle ⑧.
3) Mount the SUPPLY BRAKE ASS'Y ⑥ onto the axle ⑨.
4) After applying a thin layer of grease to the M PLATE SLIDE ASS'Y ④ as shown in Fig. A, mount it onto the two pins ⑩.
5) Mount the two special washers ③ onto the two pins ⑩.
6) After applying grease to the CONTROL PLATE LEVER ② as shown in Fig. B, mount it onto the axle ⑪. Insert the pin ⑫ of the ACT PLATE SLIDE ASS'Y into the hole ⑭, and the pin ⑬ of M PLATE SLIDE ASS'Y into the hole ⑮.
7) Mount the special washer ① onto the pin ⑫.
8) Mount the SUB TAKE-UP BRAKE as instructed in P.168.
9) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.


③Special Washer
⑤Spring Coil
②Control Plate Lever
③Special Washer
①Special Washer
④M Plate Slide Ass'y
⑭Hole
⑥Supply Brake Ass'y
⑮Hole
⑬Pin
⑦Take-up Brake Ass'y
Top side view
Fig. A
④M Plate Slide Ass'y
Bottom side view
⑩Pin
⑨Axle
⑧Axle
②Control Plate Lever
Fig. B
▨ : Apply grease portion
⑯Act Brake Slide
⑩Pin
⑫Pin
⑪Axle

When assembling, the contact surfaces of Take-up Brake ⑦ and the Brake Slide ⑯ marked with ⬚ should contact but not overlap each other.

Fig.12-2-17. **Supply Brake Ass'y & Take-up Brake Ass'y**

(3) BACK TENSION LEVER and BACK TENSION BAND ASS'Y (See Fig. 12-2-18.)

1. Removal

1) Remove the CASSETTE HOLDER MECHANISM as instructed in P.153.
2) Remove the SPRING COIL ①.
3) Remove the screw ③ and washer ⑭ fixing the BAND BRAKE BRACKET ASS'Y ②.
4) Push the SUB SUPPLY BRAKE ④ in the direction of the arrow, setting the BAND BRAKE BRACKET ASS'Y ② free.
5) Open the hook ⑤ a little and remove the TENSION LEVER ASS'Y ⑥. Take care not to open the hook ⑤ too much, otherwise it may be deformed or broken.
6) Remove the hook ⑦ of the BAND BRAKE BRACKET ASS'Y.
7) Remove the fixing washer ⑮ and then remove the SPRING COIL ⑯ and the BAND LEVER ASS'Y ⑰.

2. Remounting

1) Mount the SPRING COIL ⑯ and the BRAKE BAND LEVER ASS'Y ⑰ to the axle (21) with the fixing washer ⑮, inserting the both ends of the SPRING COIL ⑯ into the SPRING COIL holding holes ⑱ and ⑲.
2) Mount the BAND BRAKE BRACKET ASS'Y hook ⑦ into the TENSION LEVER ASS'Y hole ⑧. Insert the TENSION LEVER ASS'Y axle ⑨ into the plastic bearing hole ⑩ and confirm that the hook ⑤ is hooked.
3) While pushing the SUB SUPPLY BRAKE ④ in the direction of arrow A, wind the BAND BRAKE BRACKET ASS'Y ② around the side of the SUPPLY REEL ASS'Y ⑳.
4) Mount the BAND BRAKE BRACKET ASS'Y ② to the BRAKE BAND LEVER ASS'Y ⑰ with the screw ③ through the washer ⑭.
5) Hook the SPRING COIL ① between the hooks ⑪ and ⑫.
6) Perform TENSION POLE position adjustment as instructed in 12-3-3 (P.192).
7) Mount the CASSETTE HOLDER MECHANISM as instructed in P.153.

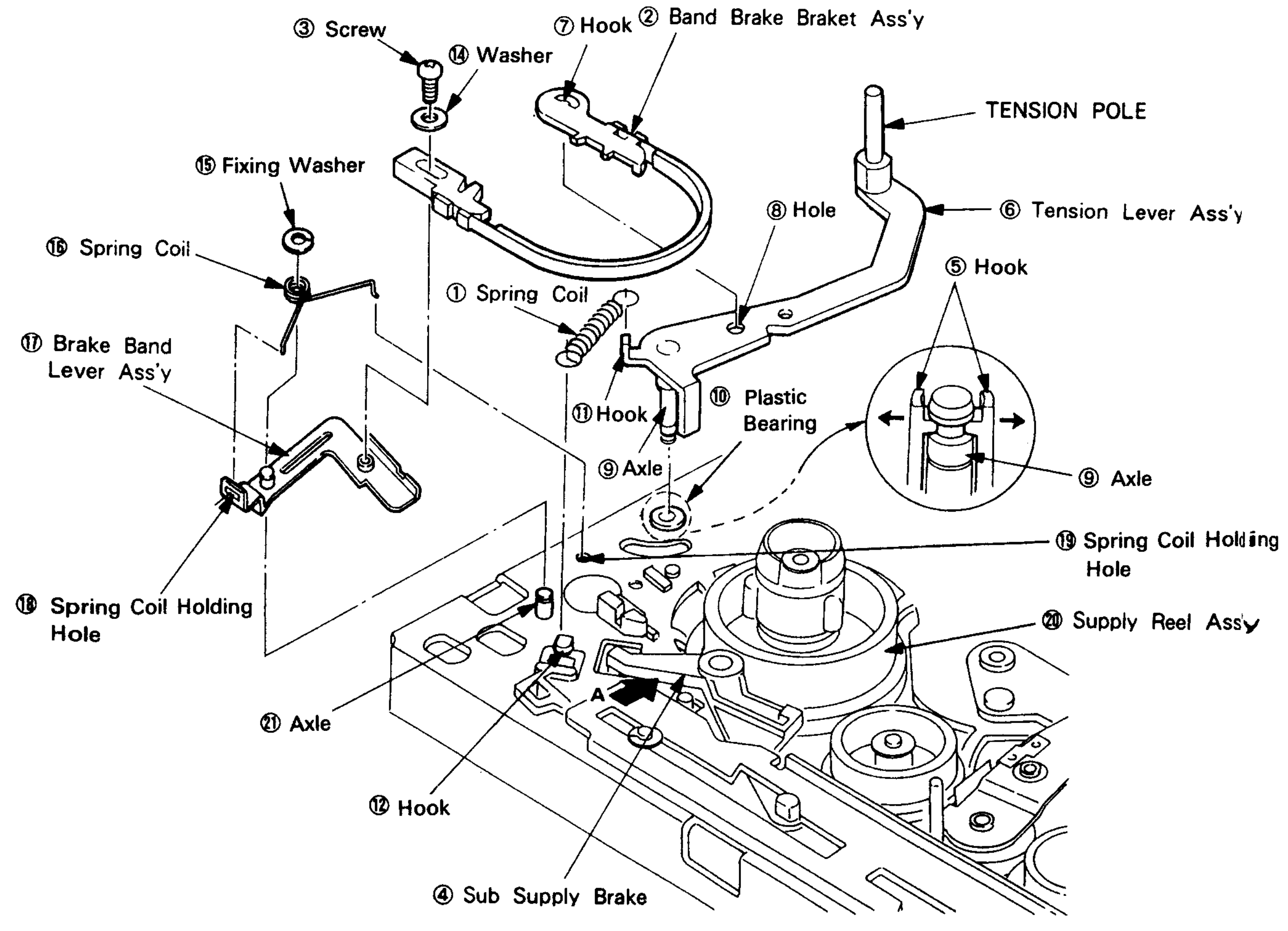

③ Screw
⑭ Washer
⑦ Hook
② Band Brake Braket Ass'y
TENSION POLE
⑮ Fixing Washer
⑧ Hole
⑥ Tension Lever Ass'y
⑯ Spring Coil
⑤ Hook
① Spring Coil
⑰ Brake Band Lever Ass'y
⑩ Plastic Bearing
⑪ Hook
⑨ Axle
⑨ Axle
⑲ Spring Coil Holding Hole
⑱ Spring Coil Holding Hole
⑳ Supply Reel Ass'y
A
㉑ Axle
⑫ Hook
④ Sub Supply Brake

Fig.12-2-18. **Tension Lever Ass'y & Band Holder Ass'y**

(4) CAPSTAN BRAKE ASS'Y (See Fig. 12-2-19.)

1. Removal

1) Remove the SPRING COIL ①.
2) Unhook the hook ②, then remove the CAPSTAN BRAKE ASS'Y ③.

2. Remounting

1) Mount the CAPSTAN BRAKE ASS'Y ③ onto the axle ④. Confirm that the hook ② is hooked to the chassis.
2) Hook the SPRING COIL ① between hooks ⑤ and ⑥. Fix the hook ⑥ side with adhesive (use an adhesive that allows later detaching).

Note: As for the model with two video heads, there are two types : one with the spring coil ① and CAPSTAN BRAKE ASS'Y ③ mounted, and one where these parts are not mounted.

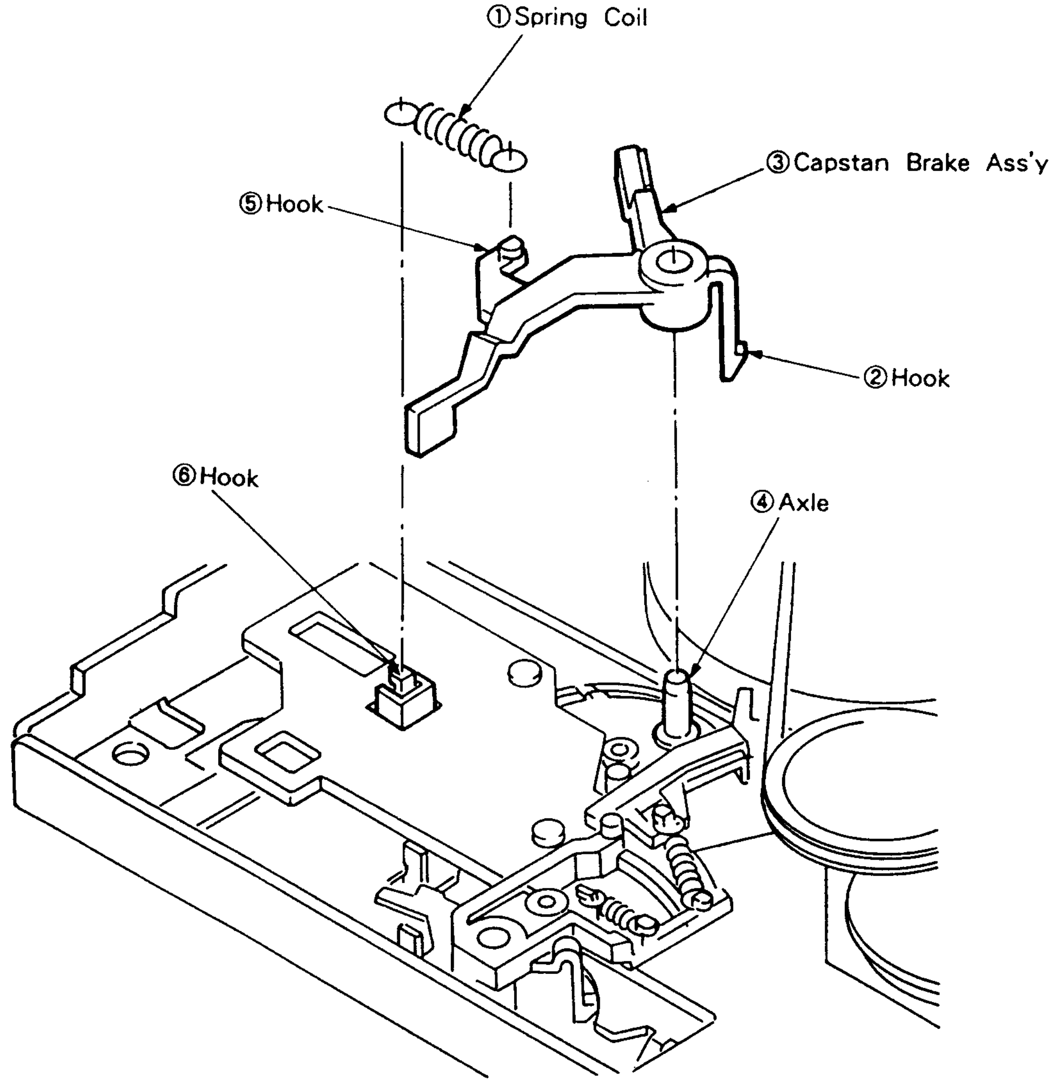


Fig.12-2-19. **Capstan Brake Ass'y**

12-2-9. REEL TABLE DRIVE MECHANISM

(1) SUPPLY REEL ASS'Y AND SUPPLY REEL GEAR (See Fig. 12-2-20.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the BRAKE BRACKET ASS'Y as instructed in P.170.
3) Set the PLAY mode with the mode selector (VHJ-0050).
4) Remove the special washer ①, then remove the SUPPLY REEL ASS'Y ② and the washer ③.
5) Remove the special washer ④.
6) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, remove the SUPPLY REEL GEAR ⑥ and the washer ⑦.

Note: Be sure that no dirt gets on the section where both brake shoes make contact.

2. Remounting

1) Apply a little oil (less than one drop) to the part of the axle ⑧ indicated by the arrow B, then mount the washer ⑦.
2) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, mount the SUPPLY REEL GEAR ⑥ onto the axle ⑧.
3) Mount the special washer ④ to the axle ⑧.
4) Apply 1 drop of oil to the part of the axle ⑨ indicated by the arrow C, then mount the washer ③.
5) Mount the SUPPLY REEL ASS'Y ② onto the axle ⑨.
6) Perform reel table height adjustment as instructed in P.190.
7) Mount the special washer ① onto the axle ⑨.
8) Mount the BAND BRAKE BRACKET ASS'Y as instructed in P.170.
9) Perform tension pole position adjustment as instructed in 12-3-3 (P.192).
10) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.

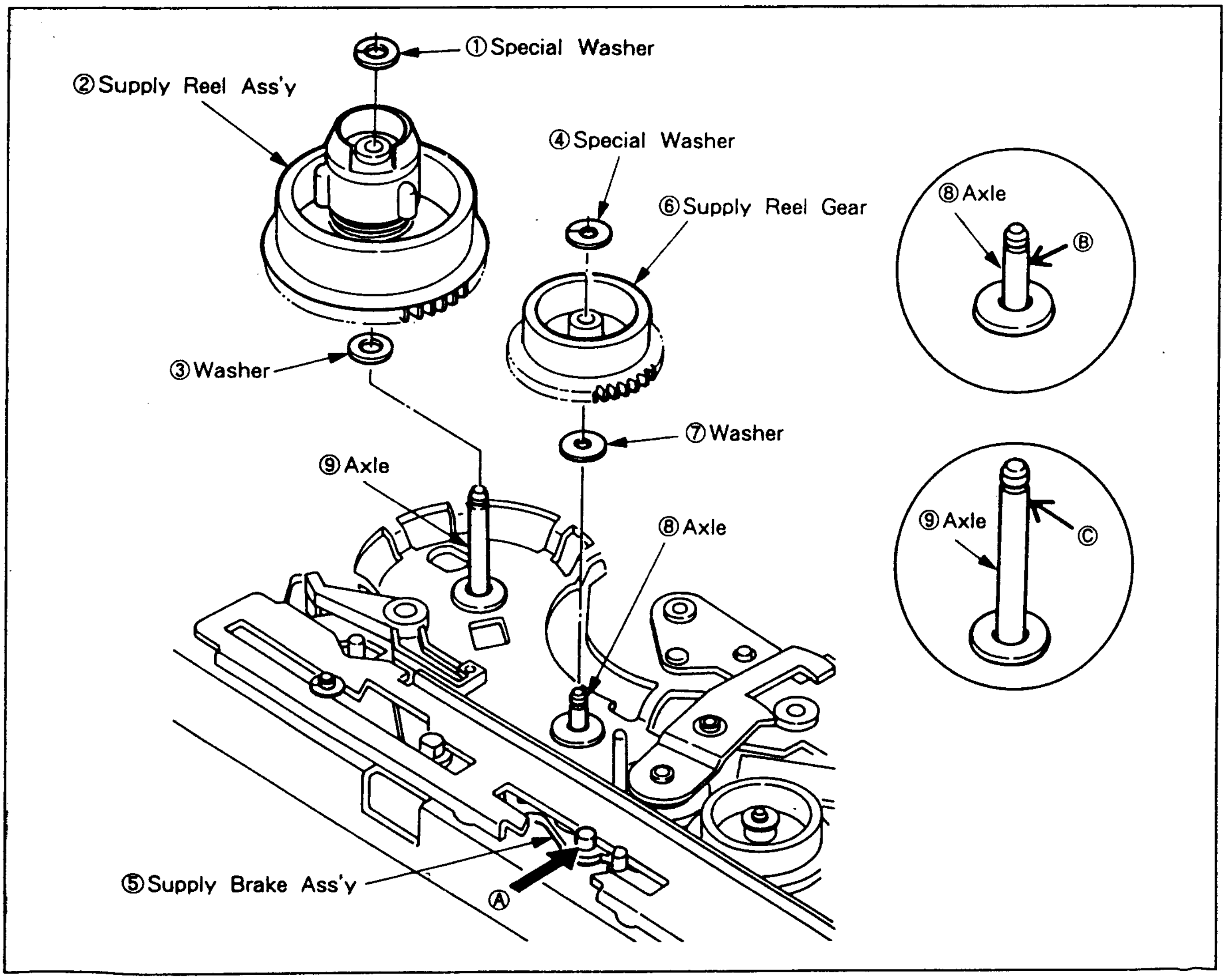


Fig.12-2-20. **Supply Reel Ass'y & Supply Reel Gear**

(2) TAKE-UP REEL ASS'Y (See Fig. 12-2-21.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the special washer ①.
3) Push the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A to release the brake, then remove the TAKE-UP REEL ASS'Y ③ and the washer ④.

Note: Be sure that no dirt gets on the section where both brake shoes make contact.

2. Remounting

1) Apply 1 drop of oil to the part of the axle ⑤ indicated by the arrow B, then mount the washer ④.
2) While pushing the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A, mount the TAKE-UP REEL ASS'Y ③ onto the axle ⑤.
3) Perform reel table height adjustment as instructed in 12-3-2 (P.190).
4) Mount the special washer ① onto the axle ⑤.
5) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.

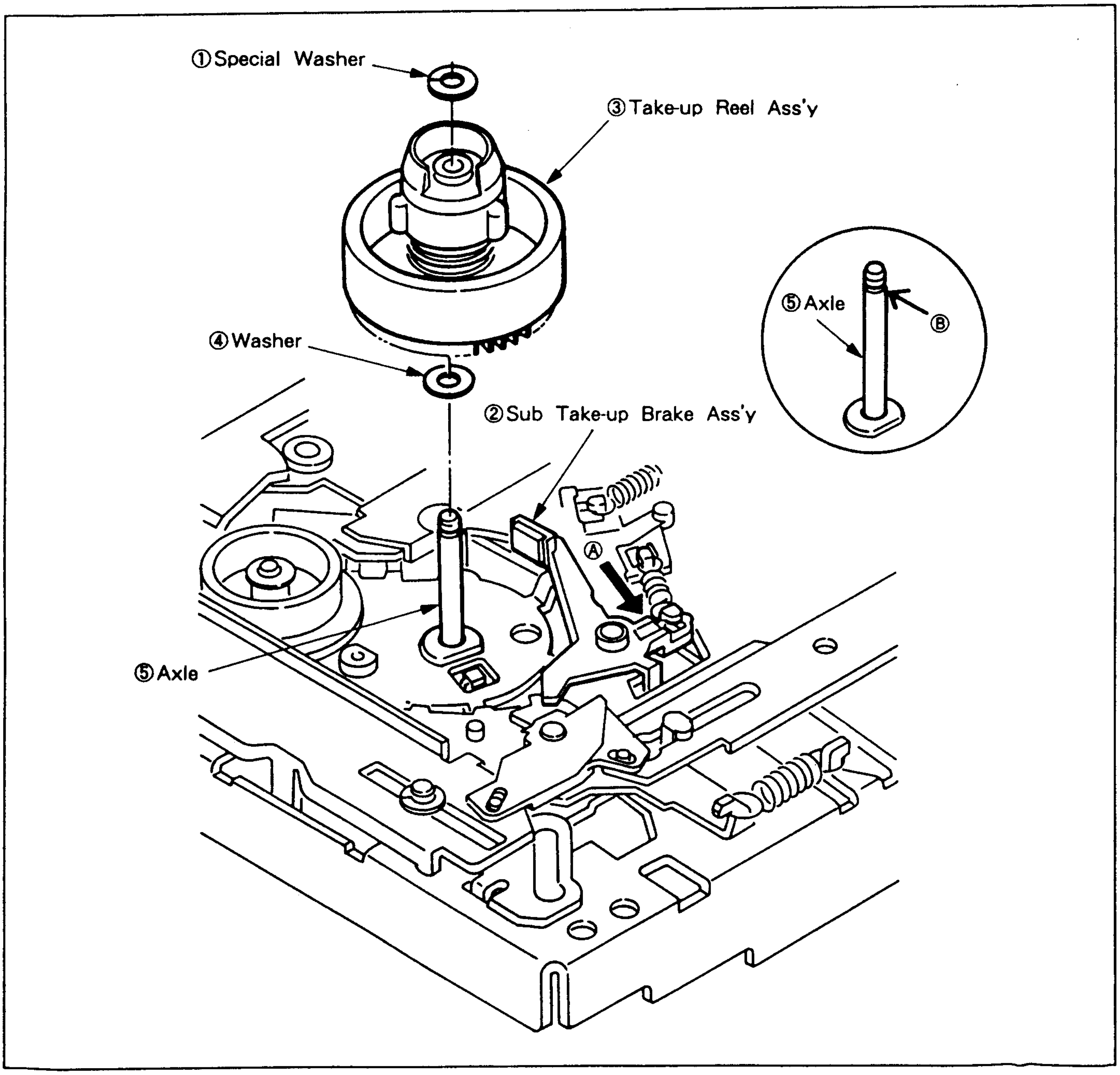


Fig.12-2-21. **Take-up Reel Ass'y**

(3) TAKE-UP REEL GEAR (See Fig. 12-2-22.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the TAKE-UP REEL ASS'Y as instructed in P.173.
3) Remove the SUB TAKE-UP BRAKE ASS'Y as instructed in P.168.
4) Remove the TAKE-UP BRAKE ASS'Y as instructed in P.169.
5) Remove the special washer ①, then remove the TAKE-UP REEL GEAR ③ and the washer ④.

2. Remounting

1) Apply a little oil (less than one drop) to the part of the axle ⑤ indicated with an arrow.
2) Mount the washer ④ and the TAKE-UP REEL GEAR ③ onto the axle ⑤.
3) Mount the special washer ① onto the axle ⑤.
4) Mount the TAKE-UP BRAKE ASS'Y as instructed in P.169.
5) Mount the SUB TAKE-UP BRAKE ASS'Y as instructed in P.168.
6) Mount the TAKE-UP REEL ASS'Y as instructed in P.173.
7) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.

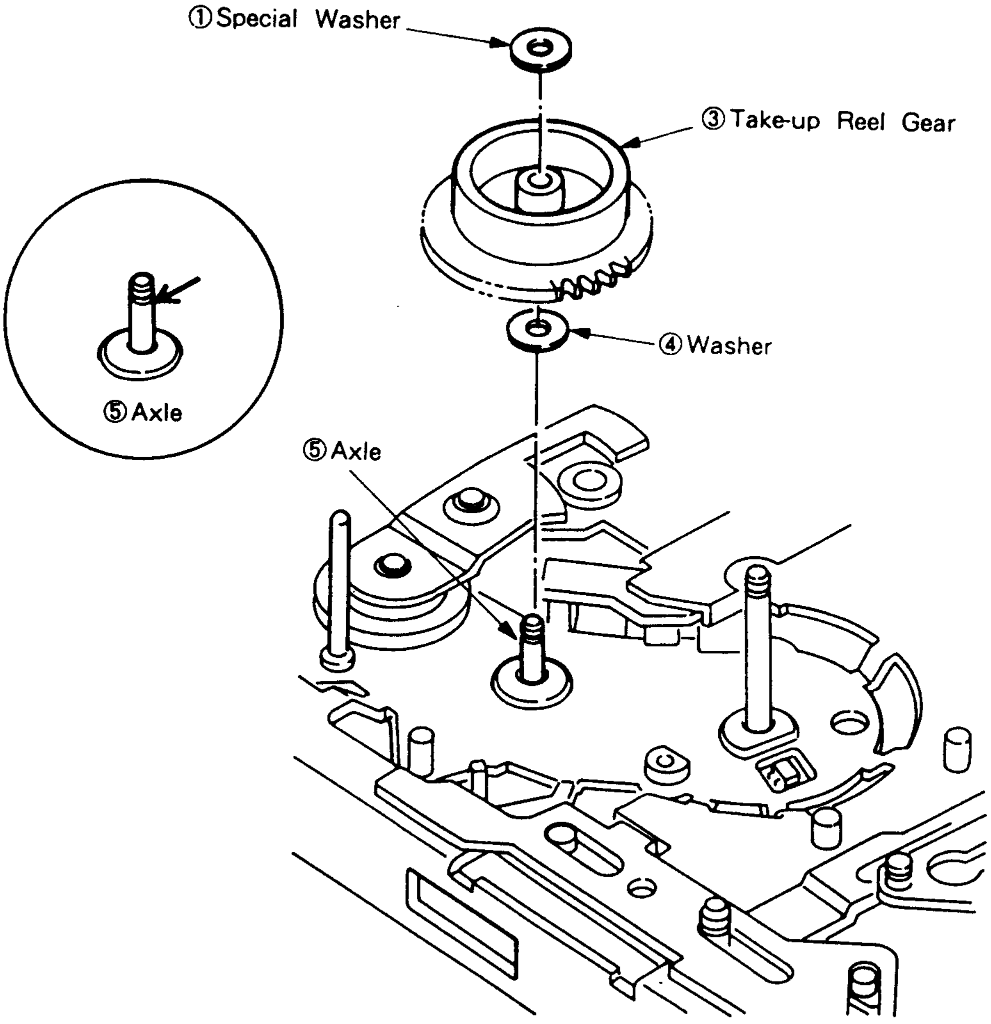


Fig.12-2-22. Take-up Reel Gear

(4) REEL PULLEY AND FRICTION GEAR ASS'Y (See Fig. 12-2-23.)

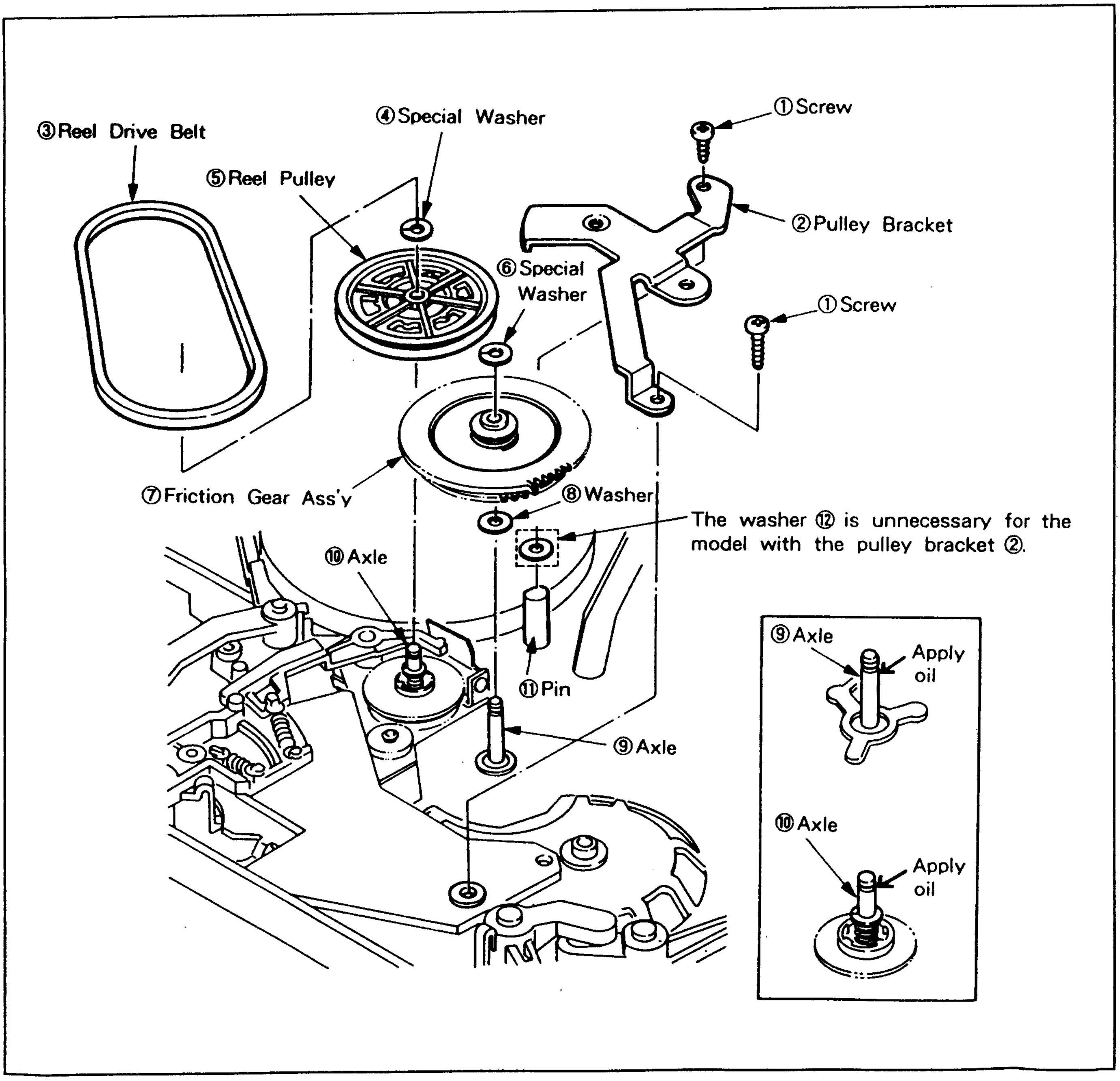
1. Removal

1) Remove the two screws ①, then remove the PULLEY BRACKET ②.
2) Remove the REEL DRIVE BELT ③.
3) Remove the special washer ④, then remove the REEL PULLEY ⑤.
4) Remove the special washer ⑥, then remove the FRICTION GEAR ASS'Y ⑦ and the washer ⑧.

Note: Some model may not incorporate the pulley bracket ②. Washer ⑫ is mounted on the pin ⑪ with a screw ①, and servesas the PULLEY BRACKET ②.

2. Remounting

1) Apply one drop of oil to the parts of axles ⑨ and ⑩ indicated with arrows.
2) Mount the washer ⑧ and the FRICTION GEAR ASS'Y ⑦ onto the axle ⑨.
3) Mount the special washer ⑥ onto the axle ⑨.
4) Mount the REEL PULLEY ⑤ onto the axle ⑩.
5) Mount the special washer ④ onto the axle ⑩.
6) Set the REEL DRIVE BELT ③.
7) Mount the PULLEY BRACKET ② with the two screws ①.


③Reel Drive Belt
④Special Washer
①Screw
⑤Reel Pulley
②Pulley Bracket
⑥Special Washer
①Screw
⑦Friction Gear Ass'y
⑧Washer
⑩Axle
⑪Pin
⑨Axle
⑨Axle
Apply oil
⑩Axle
Apply oil

The washer ⑫ is unnecessary for the model with the pulley bracket ②.

Fig.12-2-23. Reel Pulley & Friction Gear

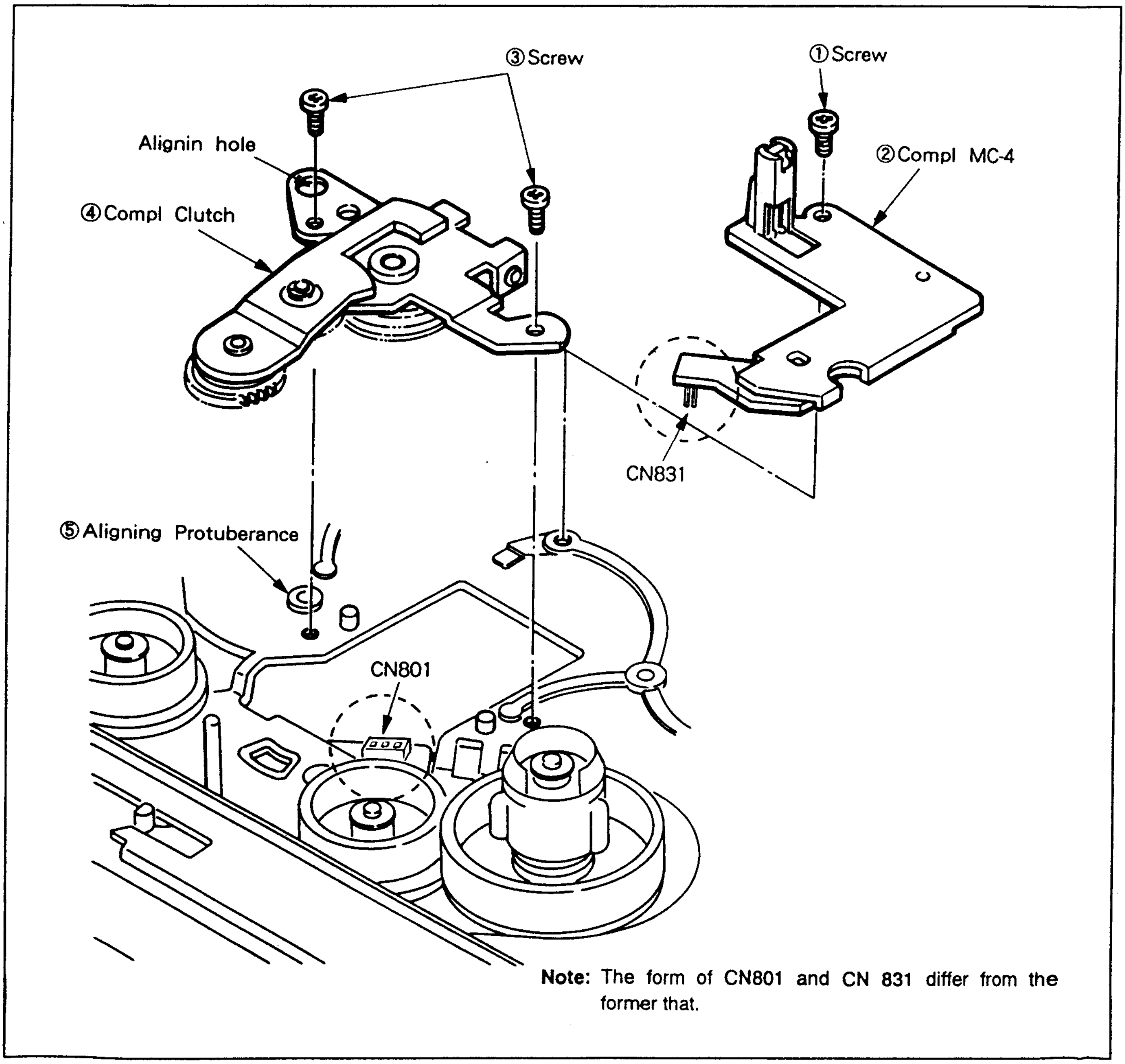
(5) COMPL CLUTCH (See Fig. 12-2-24.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in P.175.
3) Remove the screw ①, then remove the COMPL MC-4 ②.
4) Remove the two screws ③, then remove the COMPL CLUTCH ④.

2. Remounting

1) Mount the COMPL CLUTCH ④ with the two screws ③, aligning it with the protuberance ⑤.
2) After inserting the CN831 (COMPL MC-4) into the CN801 (COMPL MC-1), mount the COMPL MC-4 with the screw ①.
3) Mount the REEL PULLEY, the REEL DRIVE BELT and the PULLEY BRACKET as instructed in P.175.
4) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.


③Screw
①Screw
Alignin hole
②Compl MC-4
④Compl Clutch
CN831
⑤Aligning Protuberance
CN801

Note: The form of CN801 and CN 831 differ from the former that.

Fig.12-2-24. Compl Clutch

(6) CLUTCH CHANGE LEVER AND CLUTCH LEVER ASS'Y (See Fig. 12-2-25.)

1. Removal

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in P.171.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in P.175.
3) Remove the SPRING COIL ①.
4) Unhook the hook ②, then remove the CLUTCH CHANGE LEVER ③.
5) Unhook the hook ⑤, then remove the CLUTCH LEVER ASS'Y ⑥.

2. Remounting

1) Mount the CLUTCH LEVER ASS'Y ⑥ onto the axle ⑦. Confirm that the hook ⑤ is hooked to the chassis.
2) Mount the CLUTCH CHANGE LEVER ③ onto the axle ⑧. Confirm that the hook ② is hooked to the chassis.
3) Hook the SPRING COIL ① between the hooks ⑨ and ⑩.
4) Mount the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in P.175.
5) Mount the CAPSTAN BRAKE ASS'Y as instructed in P.171.

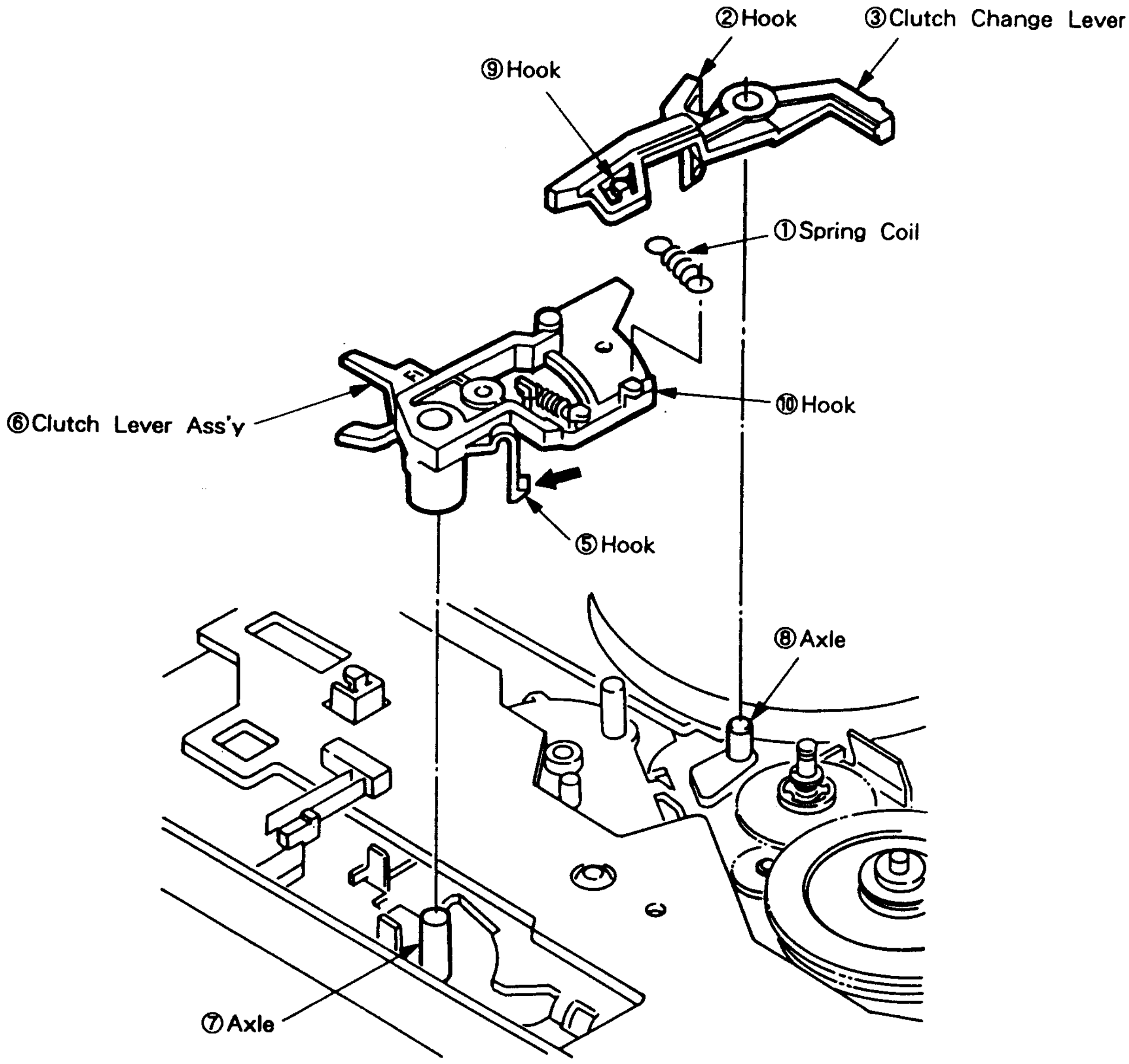

②Hook
③Clutch Change Lever
⑨Hook
①Spring Coil
⑥Clutch Lever Ass'y
⑩Hook
⑤Hook
⑧Axle
⑦Axle

Fig.12-2-25. Clutch Change Lever & Clutch Lever Ass'y

12-2-10. CAPSTAN MOTOR
(See Fig. 12-2-26.)

1. Removal

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in P.171.
2) Remove the CAPSTAN MOTOR ⑥ connector.
3) Remove the REEL DRIVE BELT ② from the CAPSTAN MOTOR PULLEY ①.
4) Remove the two screws ④ fixing the COMPL CASSETTE MECHANISM TOP BOARD ③, then slide the TOP BOARD ③ backward.
5) Remove the three screws ⑤, then remove the CAPSTAN MOTOR ⑥.

Note: Take care not to scratch or soil the capstan axle.

2. Remounting

1) Mount the CAPSTAN MOTOR ⑥ with the three screws ⑤.
2) Connect the CAPSTAN MOTOR ⑥ connector.
3) Mount the TOP BOARD ③ with the two screws ④.
4) Fit the REEL DRIVE BELT ② around the CAPSTAN MOTOR PULLEY ① and the REEL PULLEY ⑦.
5) Mount the CAPSTAN BRAKE ASS'Y as instructed in P.171.

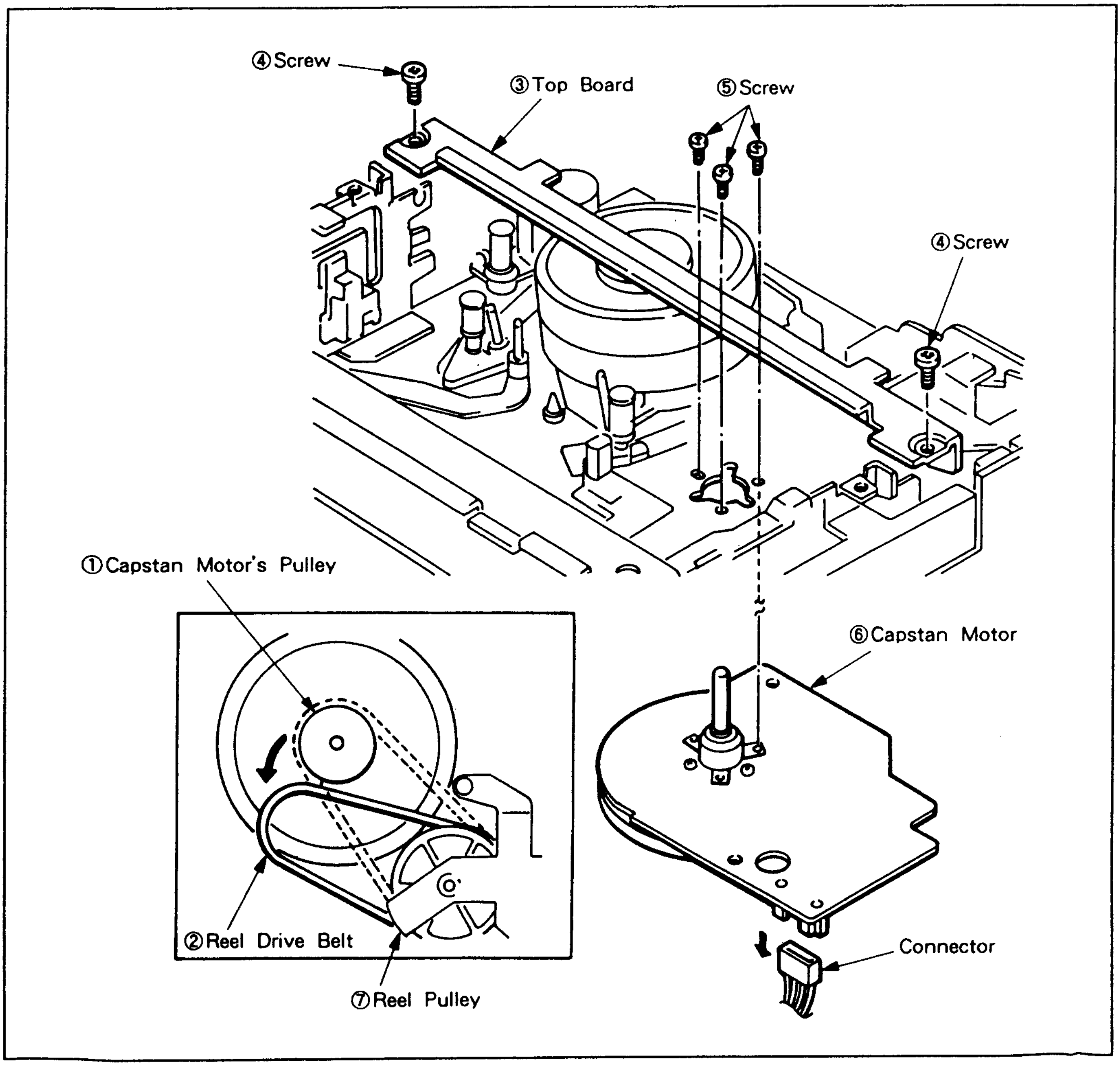

④Screw
③Top Board
⑤Screw
④Screw
①Capstan Motor's Pulley
⑥Capstan Motor
②Reel Drive Belt
⑦Reel Pulley
Connector

Fig.12-2-26. **Capstan Motor**

12-2-11. FIXED GUIDE, FE HEAD LEVER ASS'Y

(1) S-SIDE FIXED GUIDE AND FE LEVER ASS'Y (See Fig. 12-2-27.)

1. Removal

1) Remove the special nut ①, then remove the GUIDE PIPE ③ and the special washer ② (lower), in that order.
2) Remove the SPRING COIL ⑤.
3) Remove the FTE HEAD connector.
4) Remove the special washer ⑥, then remove the FE HEAD LEVER ASS'Y ⑦.

2. Remounting

1) After mounting the FE LEVER ASS'Y ⑦ onto the axle ⑧, mount the special washer ⑥.
2) Hook the SPRING COIL ⑤ between the chassis notch ⑨ and the FE LEVER ASS'Y hook ⑩.
3) Mount the special washer ② (lower), the GUIDE pipe ③ and the special nut ① to the axle ⑧, in that order. At that time, do not excessively tighten the special nut ① to avoid idle rotation of the axle rivet. The height of fixing guide on the inlet side is not required.
4) Connect the connector to the FTE HEAD.

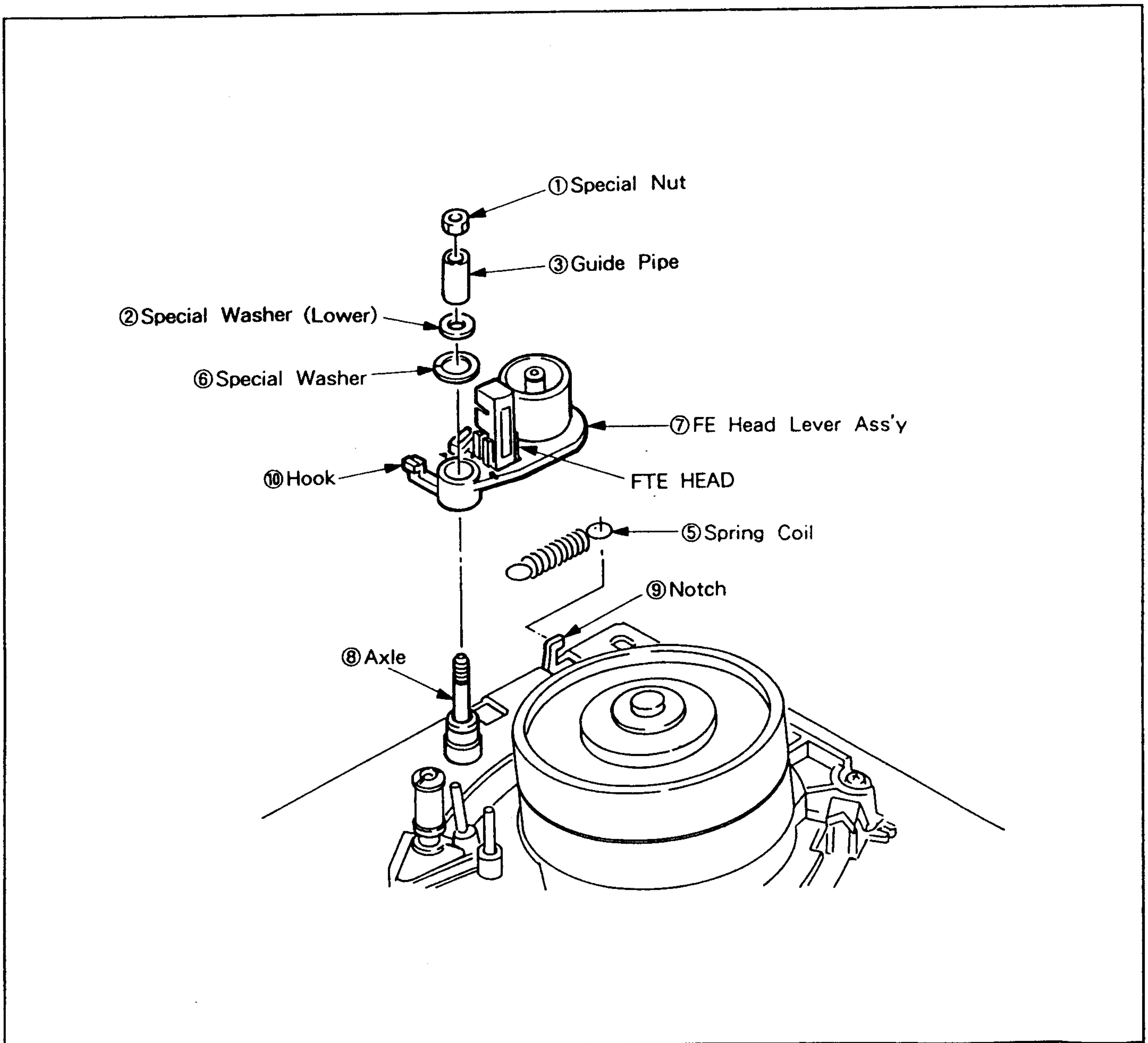

①Special Nut
③Guide Pipe
②Special Washer (Lower)
⑥Special Washer
⑦FE Head Lever Ass'y
⑩Hook
FTE HEAD
⑤Spring Coil
⑨Notch
⑧Axle

Fig.12-2-27. **Fixed Guide (S) & FE Lever Ass'y**

(2) IMPEDANCE ROLLER, FTE HEAD
(See Fig. 12-2-28.)

1. Removal

1) Remove the FTE HEAD (full track erase head) ① connector.
2) Remove the special washer ②, then remove the IMPEDANCE ROLLER ③ and the washer ④.
3) Open the hook ⑤ a little and remove the FTE HEAD ①.

Note: Take care not to open the hook too much, otherwise it may be deformed or broken.

2. Remounting

1) Mount the FTE HEAD ① onto the FE HEAD LEVER ASS'Y ⑥. Confirm that the hook ⑤ is hooked to the FTE HEAD ①.
2) Mount the washer ④ and the IMPEDANCE ROLLER ③, in that order, onto the axle ⑦, then mount the special washer ②.
3) Connect the connector to the terminal of the FTE HEAD ①.

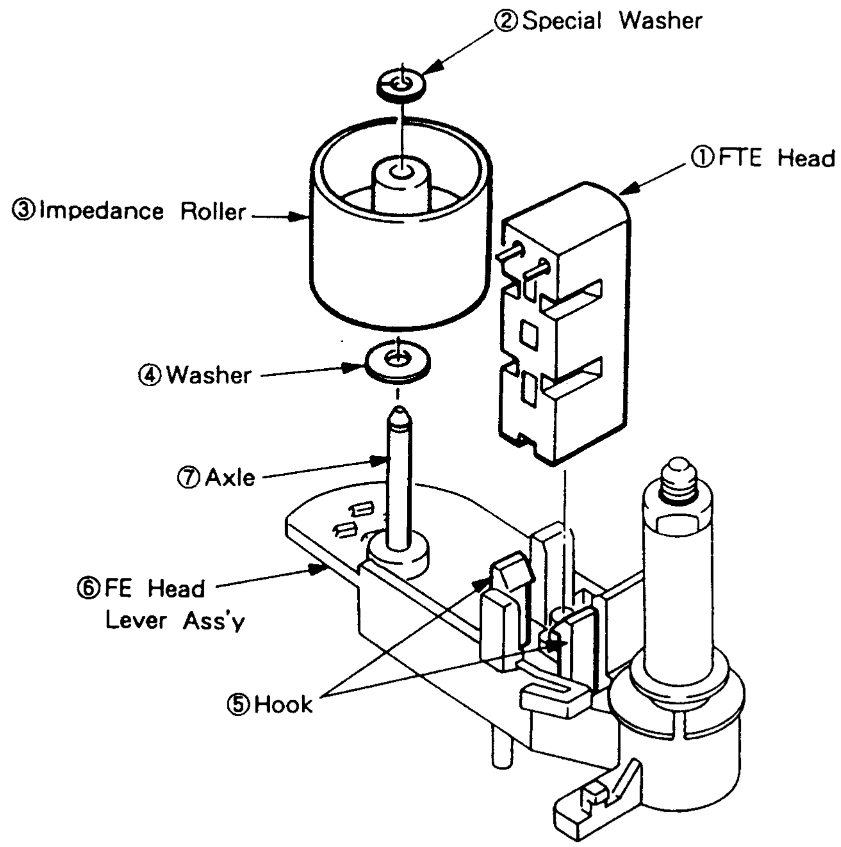

②Special Washer
①FTE Head
③Impedance Roller
④Washer
⑦Axle
⑥FE Head Lever Ass'y
⑤Hook

Fig.12-2-28. Impedance Roller & FTE Head

(3) FIXED GUIDE (T) (See Fig. 12-2-29.)

1. Removal

1) Remove the CAP ①.
2) Remove the special nut ②, then remove the special washer ③ (upper), the GUIDE PIPE ④, the special washer ③ (lower) and the SLEEVE ⑤, in that order.

2. Remounting

1) Mount the SLEEVE ⑤, the special washer ③ (lower), the GUIDE PIPE ④, the special washer ③ (upper) and the special nut ②, in that order, to the axle ⑥.
2) Mount the CAP ① onto the axle ⑥.

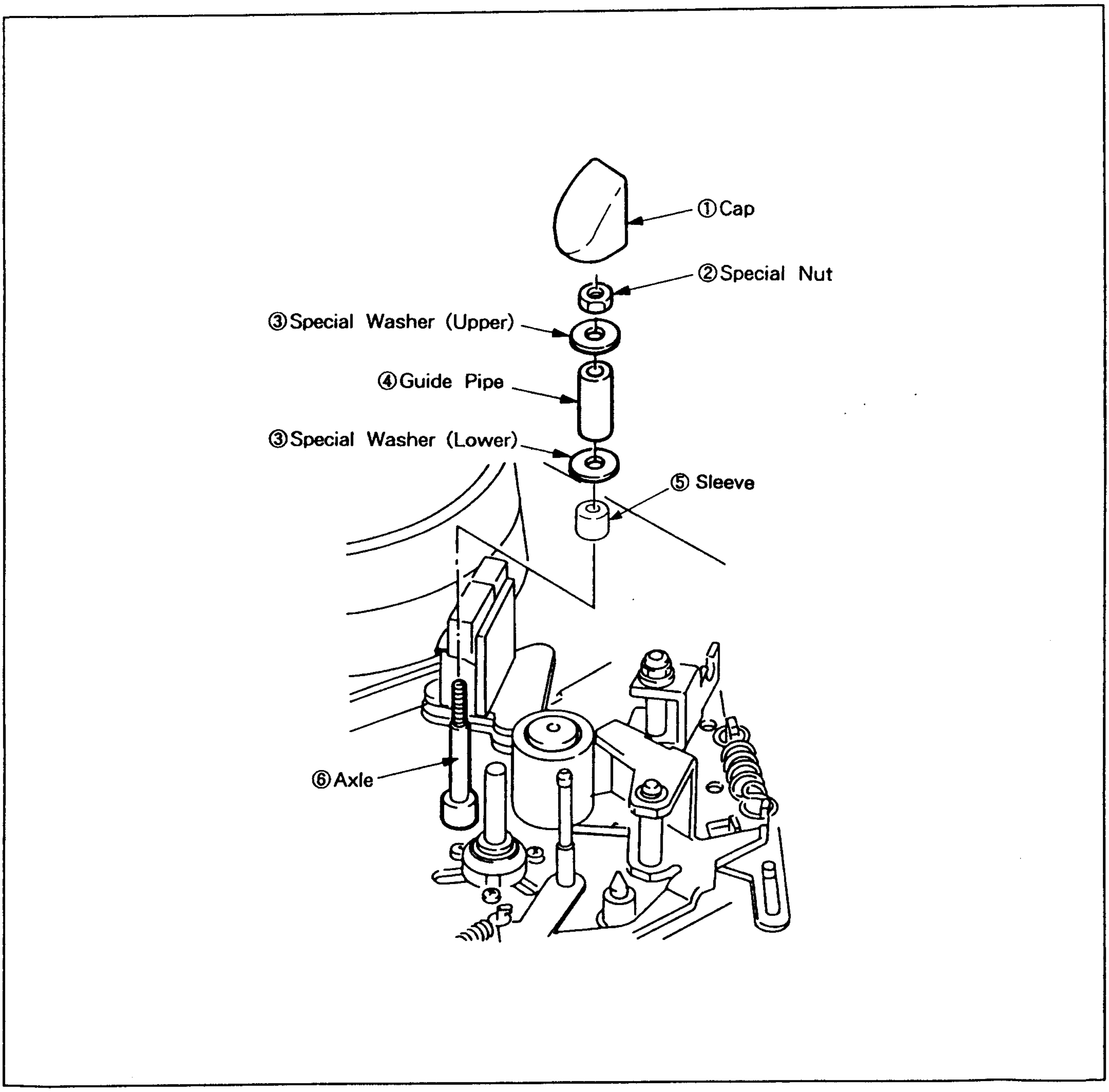

①Cap
②Special Nut
③Special Washer (Upper)
④Guide Pipe
③Special Washer (Lower)
⑤ Sleeve
⑥Axle

Fig.12-2-29. **Fixed Guide (T)**

12-2-12. DRUM SECTION

(1) DRUM MOTOR (ROTOR, STATOR) (See Fig. 12-2-30.)

1. Removal

1) Remove the screw ①, then remove the CYLINDER EARTH ASS'Y ②.
2) Remove the two screws ③, then remove the ROTOR ④ and the SPACER.
3) Remove the STATOR board connector.
4) Remove the three screws ⑤, then remove the STATOR ⑥.

2. Remounting

1) Mount the STATOR ⑥ with the three screws ⑤.
2) Mount the SPACER ⑪ onto the AXLE ⑫.
3) While aligning the ROTOR oval hole ⑦ with the ROTOR DISK hole ⑧, mount the ROTOR with the two screws ③.
4) Insert the connector ⑩.
5) While aligning the CYLINDER EARTH ASS'Y ② protuberance with the chassis hole ⑨, mount it with the screw ①.

Note 1: Use a torque driver (VHJ-0014) for mounting the STATOR ⑥ and the ROTOR ④. Set fastening torque to 3 kg-cm.

Note 2: When the drum unit has been replaced, perform a tape path adjustment as instructed in 12-3-4. and perform a PB PHASE adjustment of the servo circuit.

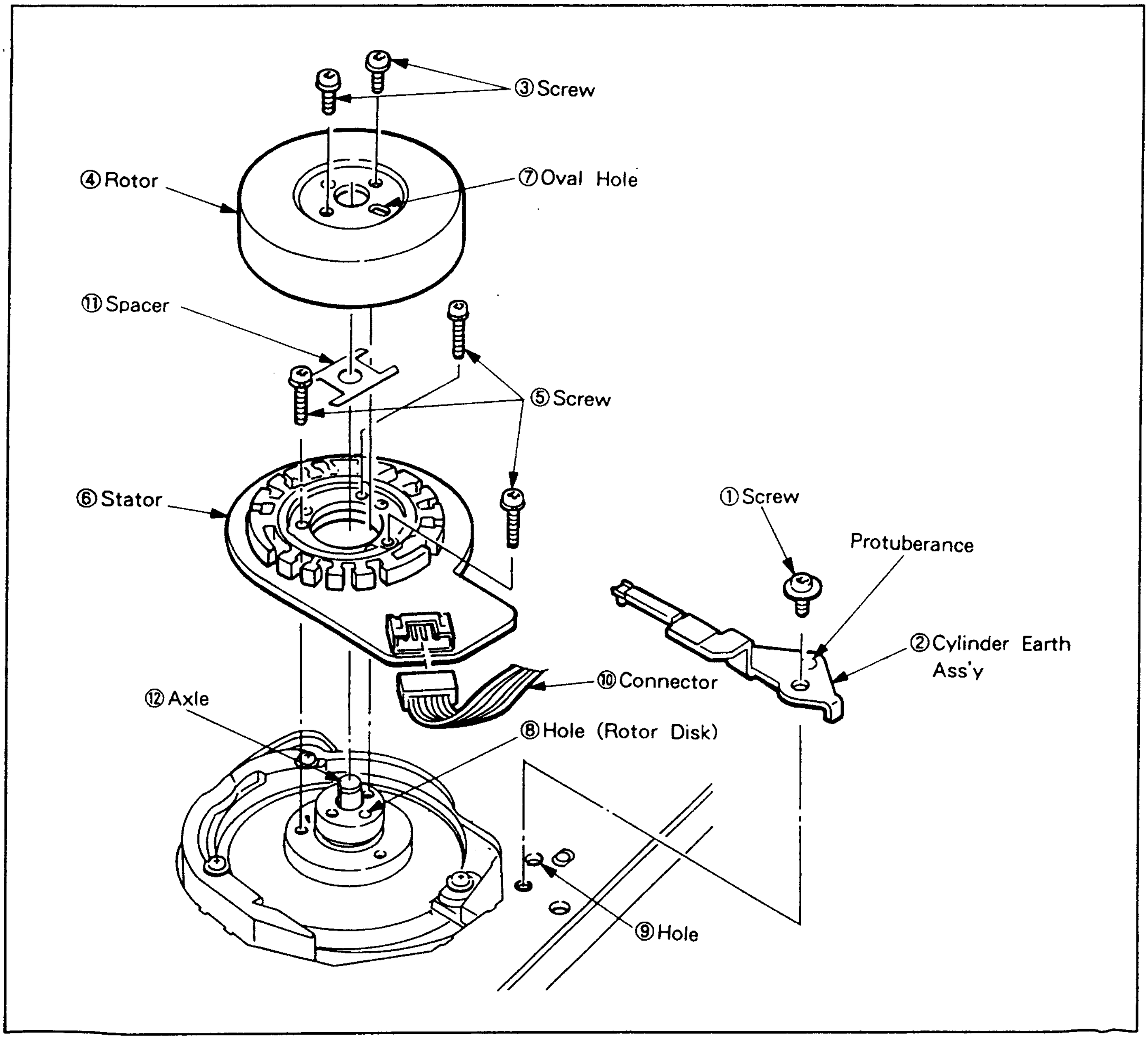

③Screw
④Rotor
⑦Oval Hole
⑪Spacer
⑤Screw
⑥Stator
①Screw
Protuberance
②Cylinder Earth Ass'y
⑩Connector
⑫Axle
⑧Hole (Rotor Disk)
⑨Hole

Fig.12-2-30. **Drum Motor**

(2) DRUM UNIT (See Fig. 12-2-31.)

1. Removal

1) For some models with the board located above the upper drum, remove the board.
2) Remove the flexible cable ① from the PRE-AMP UNIT (take care not to pull the flexible cable in the upward direction).
3) Remove the LOAD RACK only, as instructed in P.151.
4) Remove the three screws ②, then remove the drum unit ③.

Note: When removing and remounting the drum unit, handle it carefully to protect it from scratches and dirt.

2. Remounting

1) While aligning the drum unit ③ to the protuberance, mount it to the drum base (CYLINDER BASE) ⑤ with the three screws ②.
2) Mount the ROAD RACK as instructed in P.162.
3) Insert the flexible cable into the PRE-AMP UNIT.
4) Clean the drum unit.
5) Perform the tape path adjustment as instructed in 12-3-4. and perform the PB PHASE adjustment of the servo circuit.

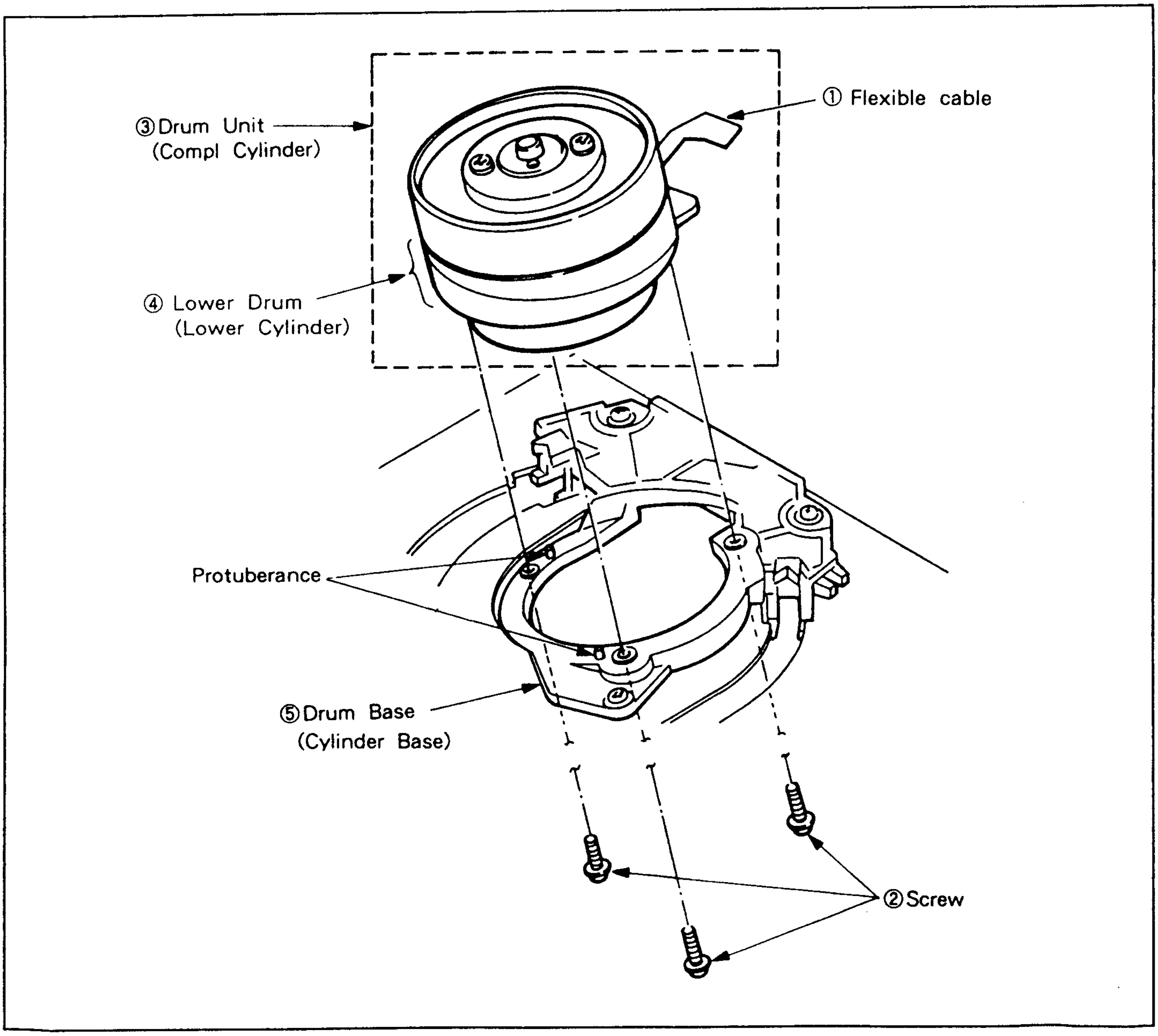

① Flexible cable
③ Drum Unit
(Compl Cylinder)
④ Lower Drum
(Lower Cylinder)
Protuberance
⑤ Drum Base
(Cylinder Base)
② Screw

Fig.12-2-31. Drum Unit (Compl Cylinder)

(3) UPPER DRUM (Upper Cylinder)

1. Removal

1) Remove the two screws ①. (See Fig.12-2-32.)
2) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum (UPPER CYLINDER), remove the lead wires soldered from the P.C. board. (See Fig.12-2-33.)
3) Turn the head removing jig (VHJ-0041) handle ② counterclockwise to lift up the stopper ③. (See Fig.12-2-34.)
4) Insert the two long screws ④ of the jig into the screw holes ⑥ located on the head chip side of the upper drum (UPPER CYLINDER) ⑤, then mount by turning the handle clockwise.
5) While holding the jig so that the upper drum ⑤ does not rotate, turn the handle ② clockwise to remove the upper drum.
6) Remove the jig from the upper drum.

Note: Handle parts carefully to protect the drum from scratches and dirt, and the video head from damage.

"Disassemble"

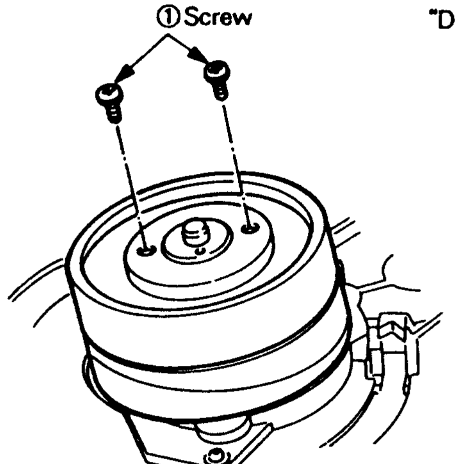


Fig.12-2-32.

Lead wires of
Rotary Erase Head (Model for flying erase capability)

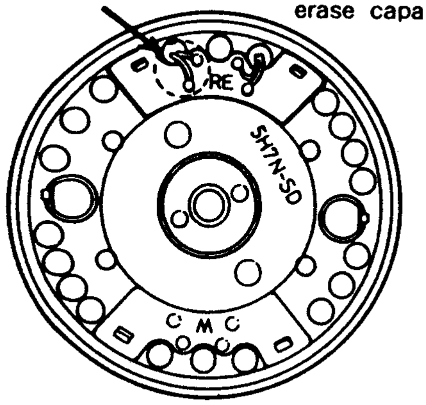

RE
SH7N-SD
C M C

Fig.12-2-33.

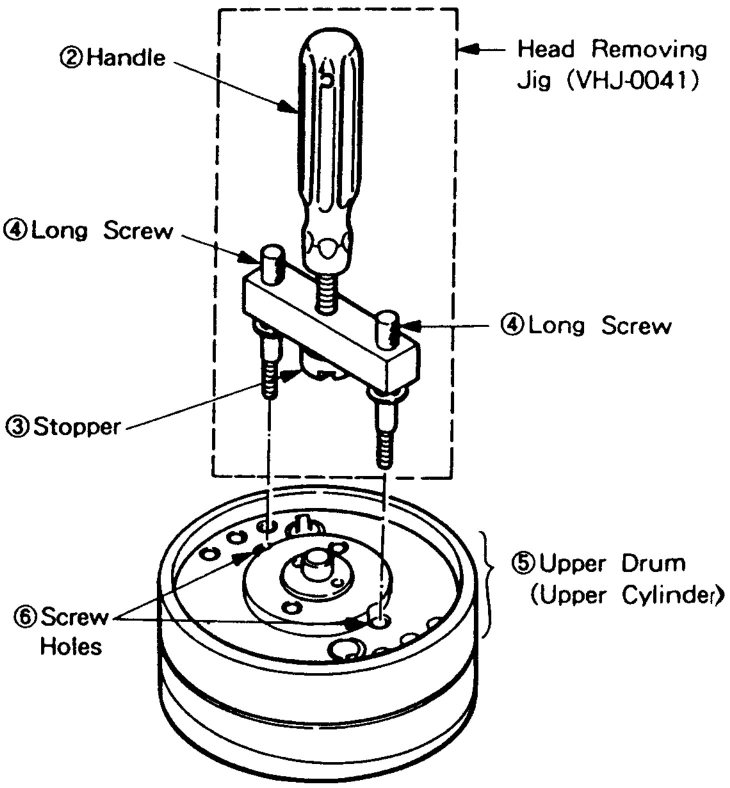

②Handle
Head Removing Jig (VHJ-0041)
④Long Screw
④Long Screw
③Stopper
⑤Upper Drum (Upper Cylinder)
⑥Screw Holes

Fig.12-2-34.

Upper Drum (Upper Cylinder)

2. Remounting (See Fig.12-2-35.)

1) Confirm that surfaces where the flywheel and the upper drum (UPPER CYLINDER) are engaged or make contact are free from scratches and dirt.
2) The code name ① of the drum is printed on the video head side of the upper drum ⑤ SP CH-1 (channel A, plus azimuth). The code name ① is set with in the rotary transformer terminal round hole side ② position of lower drum (LOWER CYLINDER), so that the two screw holes ③ of the upper drum are aligned with the two screw holes ④ of the flywheel. (Refer to 3. Recognizing the SP CH-1 Head side.)
3) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum, pass the lead wires through the lead wire hole. (See Fig.12-2-33.)
4) While keeping the upper drum ⑤ parallel to the lower drum (LOWER CYLINDER) ⑧, insert it completely into the flywheel.
5) Temporarily tighten the two screws ⑦ alternately a little at a time, then tighten them to a torque of 6 kg-cm using a torque driver (VHJ-0014) and a 3 mm bit (VHJ-0045).
6) In case the RE head is attached to the upper drum ⑤, solder the lead wires to the P.C. board. Solder the red lead wire to the R terminal, and the yellow lead wire to the Y terminal.

Note: When the upper drum has been replaced, perform a tape path adjustment as instructed in 12-3-4. and the PB PHASE adjustment of the servo circuit.

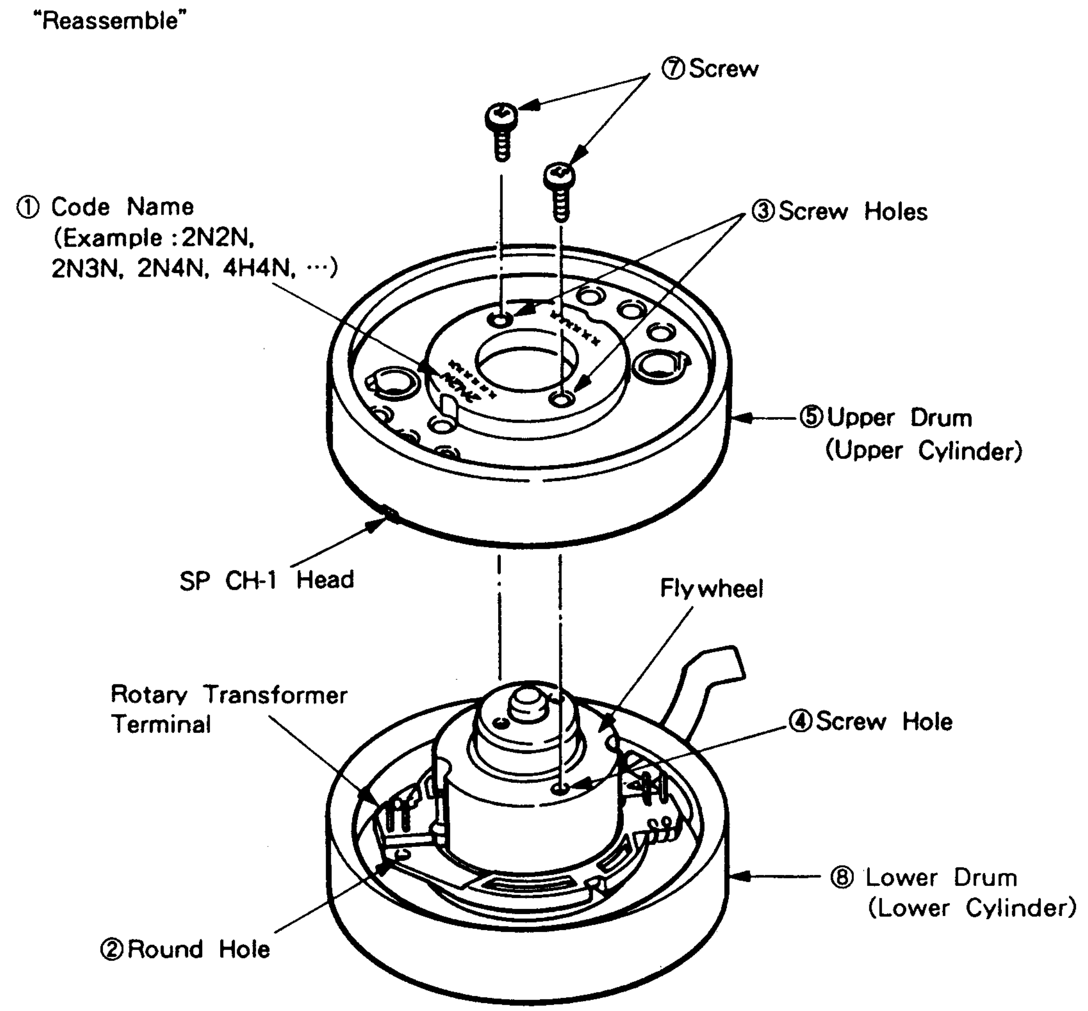

"Reassemble"
⑦Screw
① Code Name
(Example : 2N2N, 2N3N, 2N4N, 4H4N, ···)
③Screw Holes
⑤Upper Drum
(Upper Cylinder)
SP CH-1 Head
Flywheel
Rotary Transformer Terminal
④Screw Hole
⑧ Lower Drum
(Lower Cylinder)
②Round Hole

Fig.12-2-35.

3. Recognizing the SP CH-1 Head Side

No playback picture can be obtained if the video head is not wired as a pair with the rotary transformer located inside the lower drum rotating section. Therefore, mounting position should be matched when mounting the upper drum. In the P91 mechanism series, the code name of the drum is printed on the SP CH-1 (CH-A, plus azimuth) side as a mark for mounting the upper drum. (See Fig. 12-2-36.) This code name differs according to the drum type, but its basic form is as follows :

Code Name Form

②Ⓝ④Ⓝ-Ⓠ

A B C D E F

A = Number of head bases
B = "N" for normal audio
"H" for HI-FI audio
C = Number of heads
D = TV system ("N" or "P")
EF = Code for detailed classification. Depending on drum type, it can also be just one character, or a blank space.

Examples of Detailed Classification Codes
V = Head with level difference
D = Compatible with digital units
S = SVHS-compatible

Examples of Code Names
2N4N-Q …… (NTSC)
2N4P-Q …… (PAL)

Moreover, there is a round hole with marking purposes on the SP CH-1 (CH-A, plus azimuth) side of the lower drum rotary transformer terminal. As shown in Fig. 12-2-37, there are two types of rotary transformer terminals (the number of pins differs according to the number of heads).

Note: When ordering parts such as drums (CYLINDERS), do not use the code names ; always refer to the parts list and order with the specified part numbers.

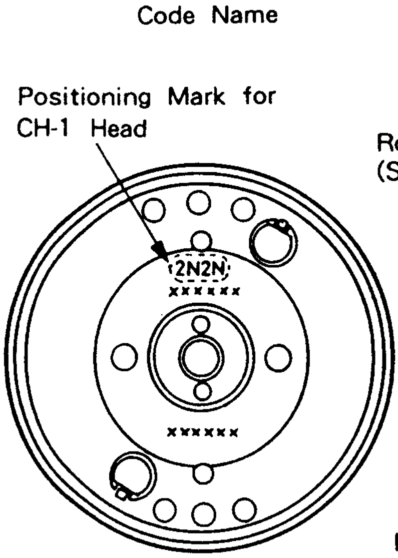

Code Name
Positioning Mark for CH-1 Head
2N2N
××××××
××××××

Fig.12-2-36. Upper Drum

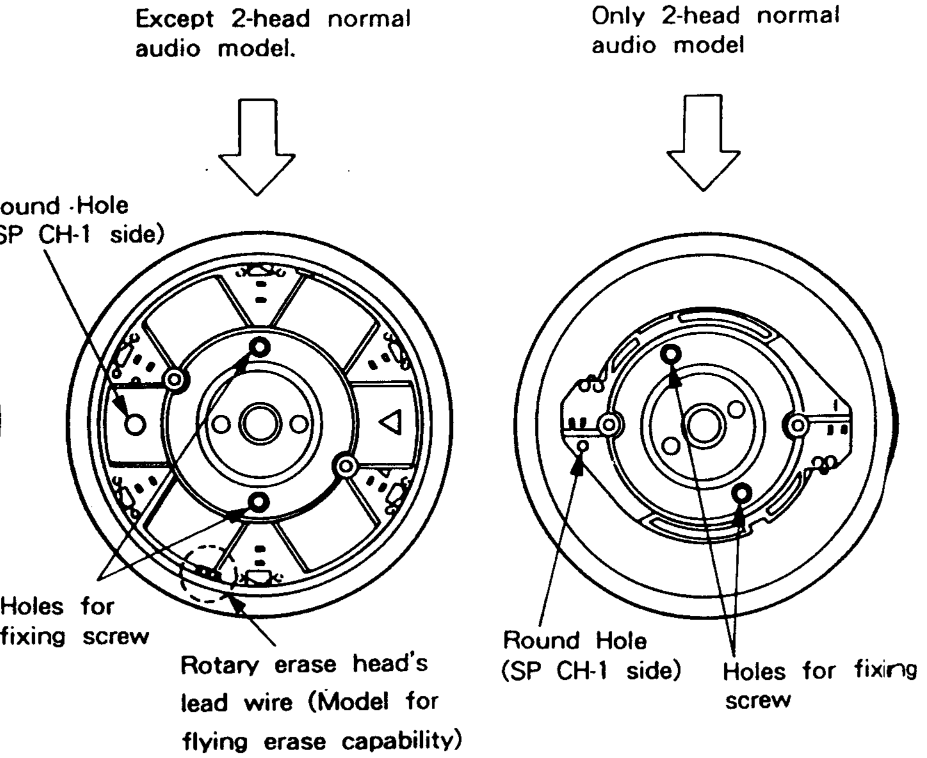

Except 2-head normal audio model.
Only 2-head normal audio model
Round Hole (SP CH-1 side)
Holes for fixing screw
Rotary erase head's lead wire (Model for flying erase capability)
Round Hole (SP CH-1 side)
Holes for fixing screw

Fig.12-2-37. Lower Drum

12-2-13. AUTO HEAD CLEANING MECHANISM (See Fig. 12-2-37.)

1. Removal

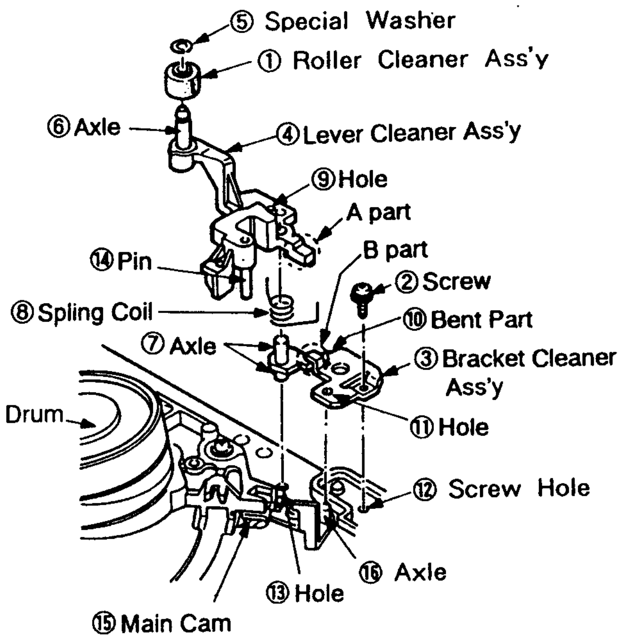
Note: • Do not hold the ROLLER CLEANER ASS'Y ① by bare hand. Use tweezers and gloves not soiled with grease or dust, etc.

• When the cleaning function deteriorates and replacing only ROLLER CLEANER ASS'Y ①, there is no need to perform item 4).

1) Make sure that the ROLLER CLEANER ASS'Y ① is not pressed against a drum (cylinder).
2) Remove the PRE-AMP UNIT and the PRE-AMP BRACKET.
3) Remove screw ②, then lift up and remove the BRACKET CLEANER ASS'Y ③.
4) With the BRACKET CLEANER ASS'Y ③ is fixed by finger, turn the LEVER CLEANER ASS'Y ④ 35° to 40° to clockwise, then lift up and remove.
5) Remove the special washer ⑤, then remove the ROLLER CLEANER ASS'Y ①.

2. Remounting

1) Mount the ROLLER CLEANER ASS'Y ① and the special washer ⑤ to the axle ⑥ of LEVER CLEANER ASS'Y.
   Mount the ROLLER CLEANER ASS'Y ① so that the mark shown in Fig. A is up side. If the mark is down side, noise may occur.
2) Mount the SPRING COIL ⑧ and the LEVER CLEANER ASS'Y ④ to the axle ⑦ of BRACKET CLEANER ASS'Y. At this time, hook the SPRING COIL ⑧ to the hole ⑨ of the LEVER CLEANER ASS'Y and the bent part ⑩ of the BRACKET CLEANER ASS'Y. "A part" of the LEVER CLEANER ASS'Y should be under "B part" of the BRACKET CLEANER ASS'Y.
3) Fix the BRACKET CLEANER ASS'Y ③ on screw hole ⑫ by screw ②. Before fasten screw ②, insert hole ⑪ of the BRACKET CLEANER ASS'Y to axle ⑯, axle ⑦ to hole ⑬ to match positions. Pin ⑭ of the LEVER CLEANER ASS'Y should be run along the circumference of the MAIN CAM ⑮ not to be came off.
4) The upper side of the lower drum should be within approx. 2mm from the lower side of the ROLLER CLEANER ASS'Y as shown in Fig. B.
5) Mount the PRE-AMP BRACKET and the PRE-AMP UNIT.


⑤ Special Washer
① Roller Cleaner Ass'y
⑥Axle
④Lever Cleaner Ass'y
⑨Hole
A part
⑭Pin
B part
②Screw
⑧Spling Coil
⑩Bent Part
⑦Axle
③Bracket Cleaner Ass'y
Drum
⑪Hole
⑫ Screw Hole
⑯ Axle
⑬Hole
⑮Main Cam

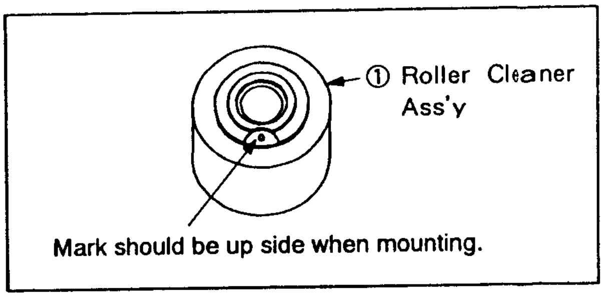

① Roller Cleaner Ass'y
Mark should be up side when mounting.

Fig. A

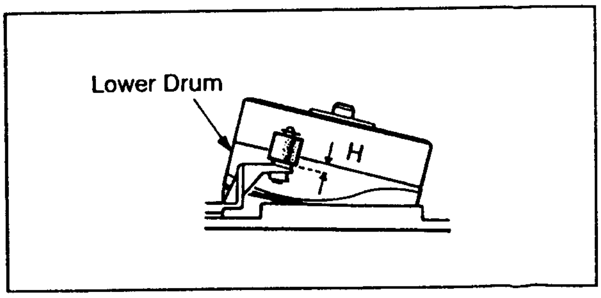
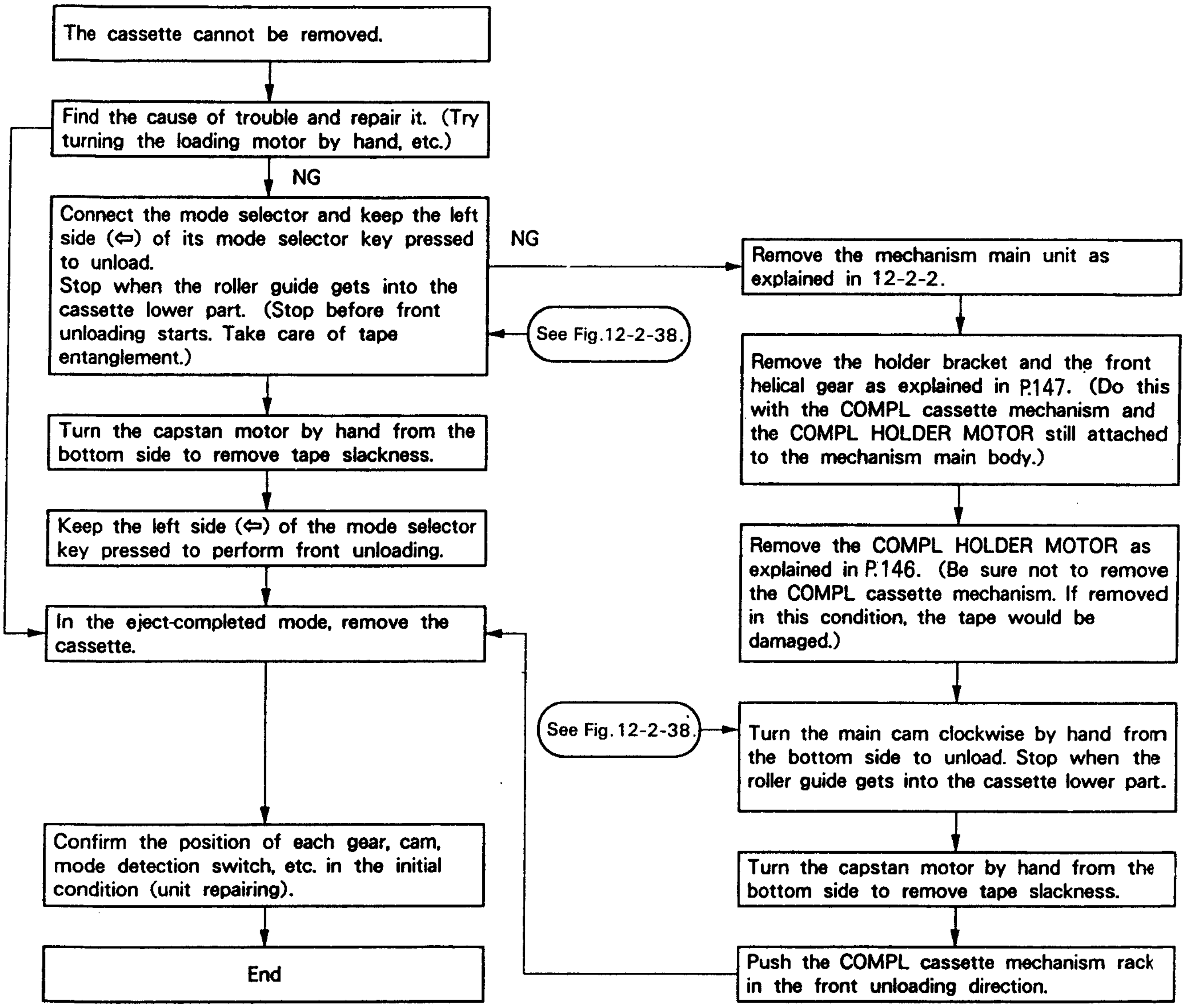

Lower Drum
H

Fig. B

Fig.12-2-37. **Auto Head Cleaning Mechanism**

12-2-14. HOW TO PROCEED WHEN THE CASSETTE CANNOT BE REMOVED



The cassette cannot be removed.

Find the cause of trouble and repair it. (Try turning the loading motor by hand, etc.)

Connect the mode selector and keep the left side (⇦) of its mode selector key pressed to unload.
Stop when the roller guide gets into the cassette lower part. (Stop before front unloading starts. Take care of tape entanglement.)

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Keep the left side (⇦) of the mode selector key pressed to perform front unloading.

In the eject-completed mode, remove the cassette.

Confirm the position of each gear, cam, mode detection switch, etc. in the initial condition (unit repairing).

End

Remove the mechanism main unit as explained in 12-2-2.

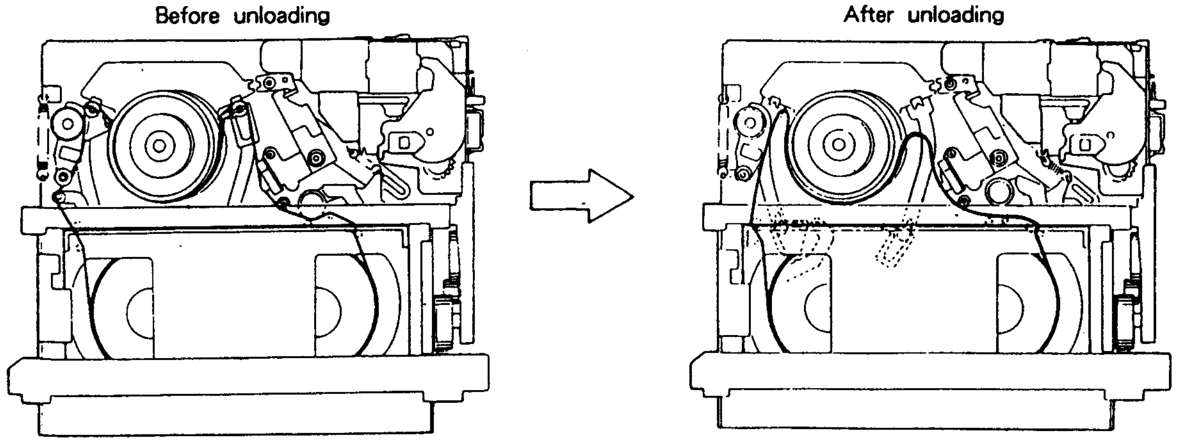
Remove the holder bracket and the front helical gear as explained in P.147. (Do this with the COMPL cassette mechanism and the COMPL HOLDER MOTOR still attached to the mechanism main body.)

Remove the COMPL HOLDER MOTOR as explained in P.146. (Be sure not to remove the COMPL cassette mechanism. If removed in this condition, the tape would be damaged.)

Turn the main cam clockwise by hand from the bottom side to unload. Stop when the roller guide gets into the cassette lower part.

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Push the COMPL cassette mechanism rack in the front unloading direction.



Perform unloading using the mode selector.

First rotate the capstan motor by hand from the bottom to take-up the tape slack, and perform front-unloading using the mode selector.

Fig.12-2-38.

12-3. MECHANISM ADJUSTMENTS

12-3-1. OPERATING THE MECHANISM WITH NO CASSETTE INSERTED (See Fig. 12-3-1.)

1) Attach black vinyl tape to the T. END and T. TOP sensors to prevent light from entering.
2) Push the TRAY LOCK LEVER in the direction of the arrow to maintain the unlocked condition. Release the lever just before the TRAY starts moving down.
3) In this condition, operation is possible in every mode. However, the following procedures are necessary to operate the unit in the REC, REW and R-SEARCH modes.

REC mode : Push the SAFETY SW LEVER to turn the SAFETY SWITCH (Erasure Prevention Switch) ON, then press the REC button. If the SAFETY SWITCH is not turned ON, the unit will enter the EJECT mode.

REW/R-SEARCH : After pressing the REW button, turn the TAKE-UP REEL ASS'Y by hand. Otherwise, the reel sensor will operate, setting into the INITIAL mode after 2 to 3 seconds.

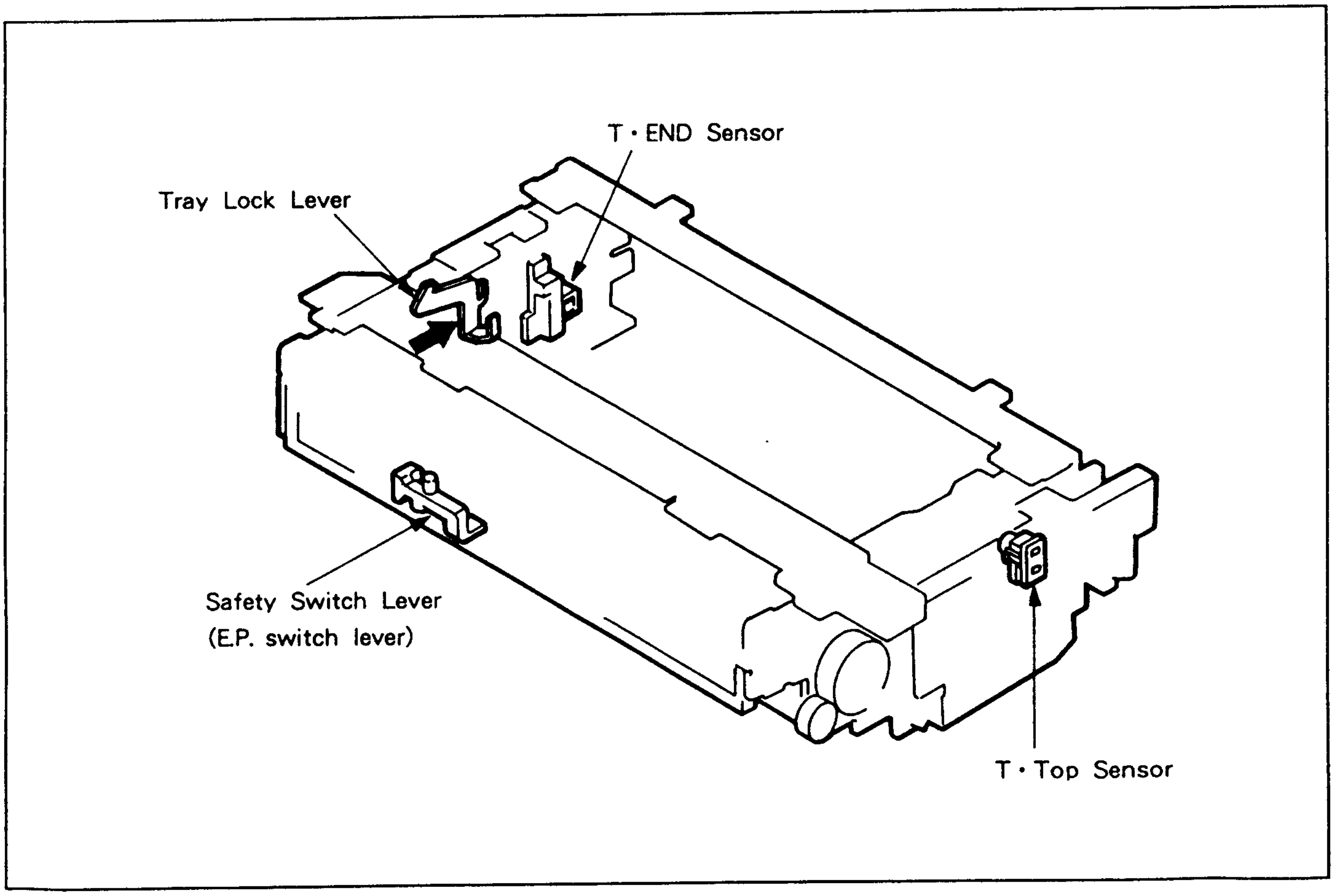


Fig.12-3-1. **Preparations for Adjustment**

12-3-2. REEL TABLE HEIGHT ADJUSTMENT AND TORQUE CHECK

(1) REEL TABLE HEIGHT (See Fig. 12-3-2.)

If the SUPPLY REEL ASS'Y or the TAKE-UP REEL ASS'Y is replaced, it will be necessary to adjust the REEL TABLE height.

(1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
(2) Attach the cassette stand plate gauge (VHJ-0001) and slide the gauge in the direction of the arrows.
(3) Confirm that, when the gauge stops, the REEL TABLEs are not in contact with surface A of the plate and are in contact with surface B.
(4) If the REEL TABLE is in contact with surface A, remove a spacer and check again.
(5) If the REEL TABLE is not in contact with surface B, add a spacer and check again.
(6) Remove the cassette stand plate gauge.
(7) Set the EJECT mode with the mode selector.
(8) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.

Note:

- Adjust the reel table height by adding or removing spacers (0.13t, 0.25t, 0.3t, 0.4t and 0.5t) as appropriate so that the height meets the specifications. Use the same method for both the TAKE-UP REEL TABLE and the SUPPLY REEL TABLE.
  (The 0.5t washer is included as the standard washer for the SUPPLY REEL ASS'Y. The 0.4t washer is included as the standard washer for the TAKE-UP REEL ASS'Y.)
- If the height of the reel table is not within the specified value, the tape edge might be damaged as a result, or the tape path adjustment might not be possible to make.

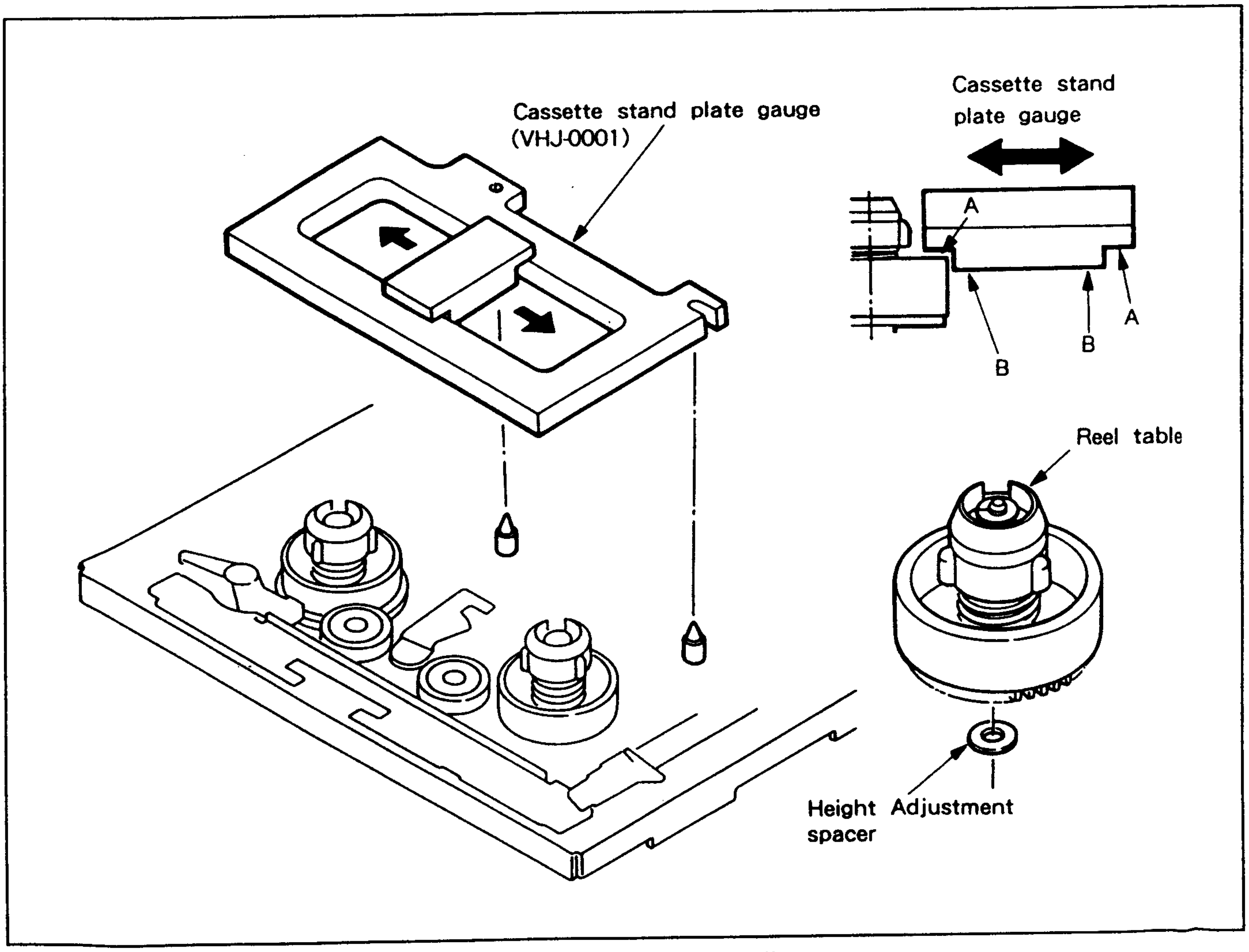


Fig.12-3-2. Reel Table Height Adjustment

(2) TORQUE CHECK (See Fig. 12-3-3.)

1) Set the unit to operating condition without a cassette inserted as instructed in 12-3-1.
2) Measure the SUPPLY REEL TABLE torque in the REW mode, and confirm that it is 600 g-cm or more. Perform this measurement keeping the torque gauge in a fixed position with your hand (locked torque).
3) Measure the TAKE-UP REEL TABLE torque in the F.FWD mode, and confirm that it is 600 g-cm or more (locked torque).
4) Measure the TAKE-UP REEL TABLE torque in the playback mode (SP tape speed), and confirm that it is within 100 through 160 g-cm (locked torque).
5) Measure the SUPPLY REEL TABLE torque in the REV (R-SEACH) mode, and confirm that it is within 210 through 280 g-cm (locked torque).
6) After confirming that torque readings are within the specifications for each mode, check the following :
   ⓐ Dirt on the capstan motor and the REEL PULLEY groove.
   ⓑ Deterioration of the REEL DRIVE BELT.
   ⓒ Deterioration of the FRICTION GEAR ASS'Y felt (torque during playback).
   ⓓ Wear and damage of the COMPL CLUTCH MECHANISM and the reel drive system gears.

Note 1: Items ⓑ, ⓒ and ⓓ require replacement if found defective.

Note 2: The measured value of torque during FF and REW represents the value 2 seconds after starting.

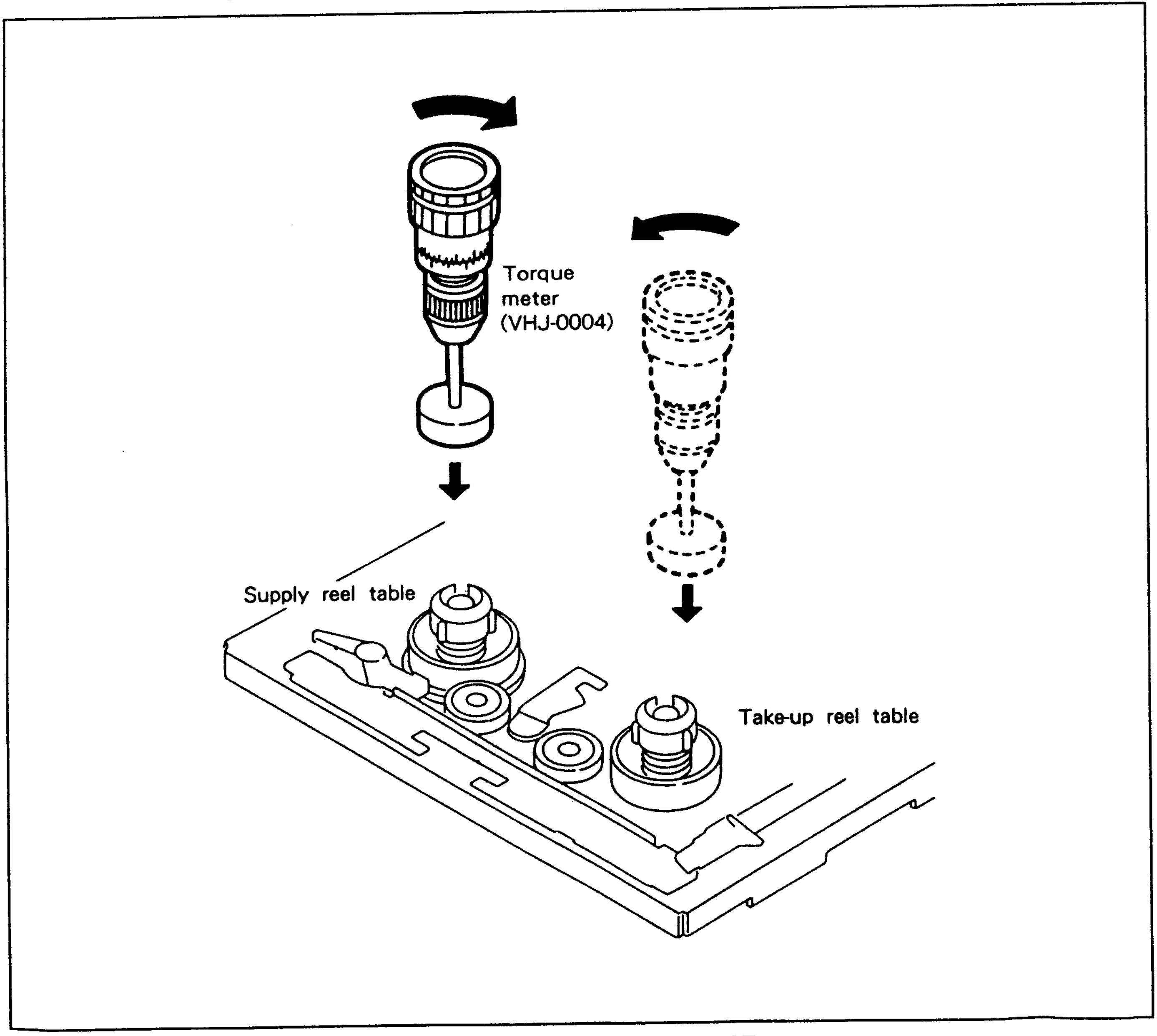


Fig.12-3-3. **Checking REW/FF/PLAY Torque**

12-3-3. TENSION POLE (BACK TENSION GUIDE) POSITION ADJUSTMENT AND BACK TENSION TORQUE CHECK

(1) TENSION POLE (BACK TENSION GUIDE) POSITION ADJUSTMENT (See Fig. 12-3-4.)

1) Remove the COMPL CASSETTE MECHANISM as instructed in P.153.
2) Set the PLAY mode with the mode selector (VHJ-0050).
3) Attach the position adjustment gauge (VHJ-0049) ①.
4) Confirm that the tension pole ② is within the position adjustment gauge frame.
5) In case the tension pole is not within the above-mentioned frame, adjust it by loosening the screw ④ a little and changing the mounting position of the BAND HOLDER ⑤ in the direction of the arrow Ⓐ.
6) Remove the position adjustment gauge ①.
7) Set the EJECT mode with the mode selector.
8) Mount the COMPL CASSETTE MECHANISM as instructed in P.153.
9) Confirm that back tension torque is within 50 ± 10 g-cm, as instructed in the following.

(2) BACK TENSION TORQUE CHECK (See Fig.12-3-4.)

1) Attach the cassette torquemeter (VHJ-0016) and set the PLAY mode.
2) Confirm that back tension torque is within 52 ± 13 g-cm.
3) In case back tension torque does not meet the above specification, proceed as follows :

ⓐ Clean the portion where the brake band (BAND HOLDER ASS'Y) ⑦ of the SUPPLY REEL ASS'Y ⑥ makes contact.

ⓑ Confirm that the brake band of the BAND HOLDER ASS'Y ⑦ does not make wear and that it is clean. If wear or dirt is found, replace the band holder assembly ⑦ as instructed in P.192.

ⓒ Replace the TENSION LEVER ASS'Y SPRING COIL ⑧.

4) Perform the Tension Pole Position Adjustment after performing ⓐ, ⓑ and ⓒ.

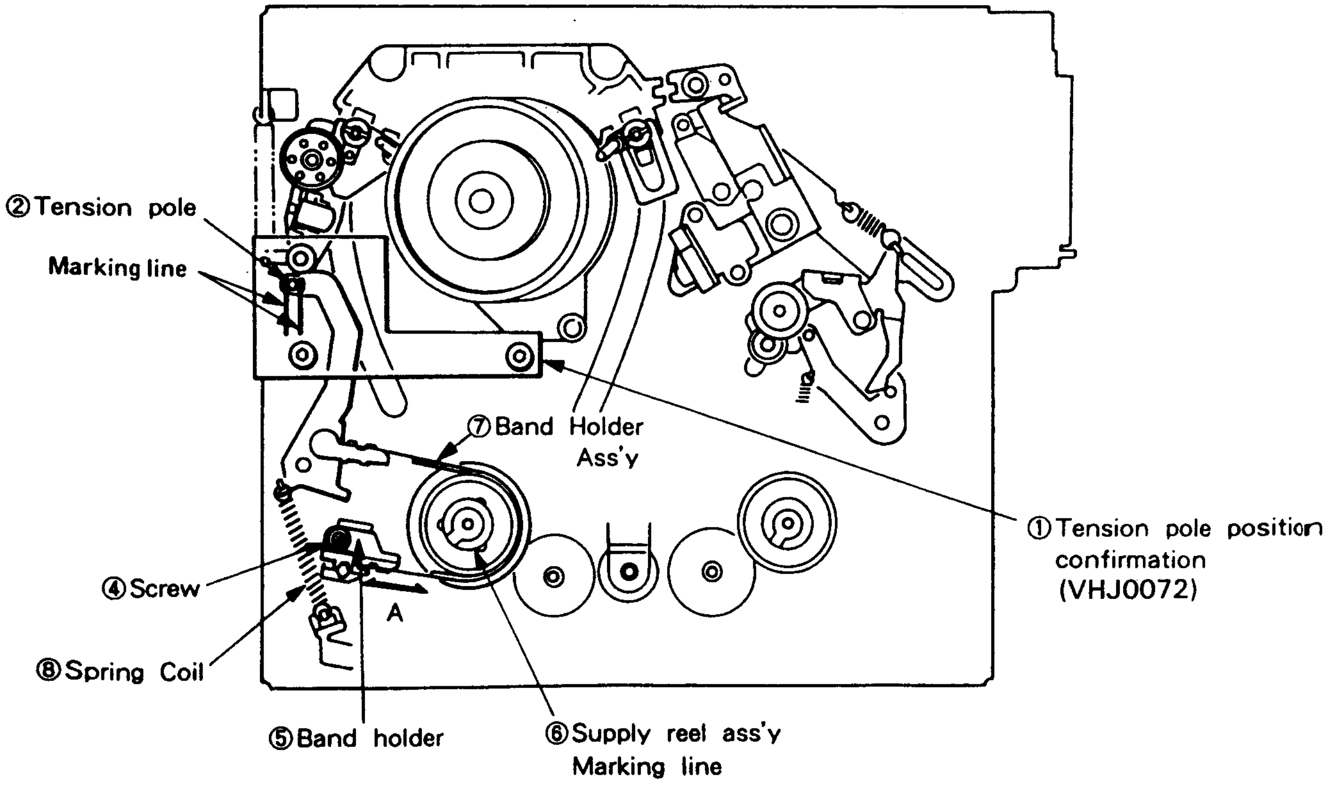


Fig.12-3-4. **Tension Pole Positioning Adjustment**

12-3-4. TAPE PATH ADJUSTMENT

The tape path mechanism is precisely adjusted at the factory. Normally no readjustment is required, but checking and/or adjustment is necessary when parts of the tape path mechanism among those shown in the figure below (See Fig. 12-3-5.) have been removed or replaced after a long period of use.
This operation consists of adjusting the various guides so that the tape drawn out from the supply reel runs smoothly along the DRUM (CYLINDER) lead surface. A way of grasping the tape path condition by electronic means is monitoring the video head output envelope waveform with an oscilloscope. However, the fact that visual observation is essential in order to know whether the tape is running through the various guides in a smooth and natural way should be kept in mind when checking and adjusting.
Also remember that the position of tape guides is not greatly affected by the replacement of the UPPER DRUM (UPPER CYLINDER) or the COMPL DRUM (COMPL CYLINDER), provided that it is correctly performed, and that only the replaced parts should be adjusted after replacing a tape guide or COMPL HEAD BRACKET, since the position of the other tape guides shall not change considerably.

(1) PREPARATIONS FOR ADJUSTMENT

(1) Clean the tape transport surfaces. (See Fig.12-3-5.)
(2) Connect the oscilloscope. Connect the channel 1 probe to the envelope waveform test point, and the channel 2 probe to the SW25 (RF SW P) test point. During adjustment, apply a trigger to the L side of the SW25 (RF SW P) in order to monitor the waveform output from channel 1 of the video head.

Note: Since oscilloscope connection points differ according to the model, refer to the "TEST POINT FOR TAPE PATH ADJUSTMENT" in the ELECTRICAL ADJUSTMENT.

(3) Use a dentist's mirror for visual observation of tape path condition.
(4) Use an eccentric driver (VHJ - 0003) for adjustment of the guide rollers.
(5) When adjusting height of the guide rollers or COMPL HEAD BRACKET, turn the special nut or the upper flange clockwise to push the tape downward, and counterclockwise to make the tape rise up.
(6) Do not use damaged cassette tapes for tape path adjustment.

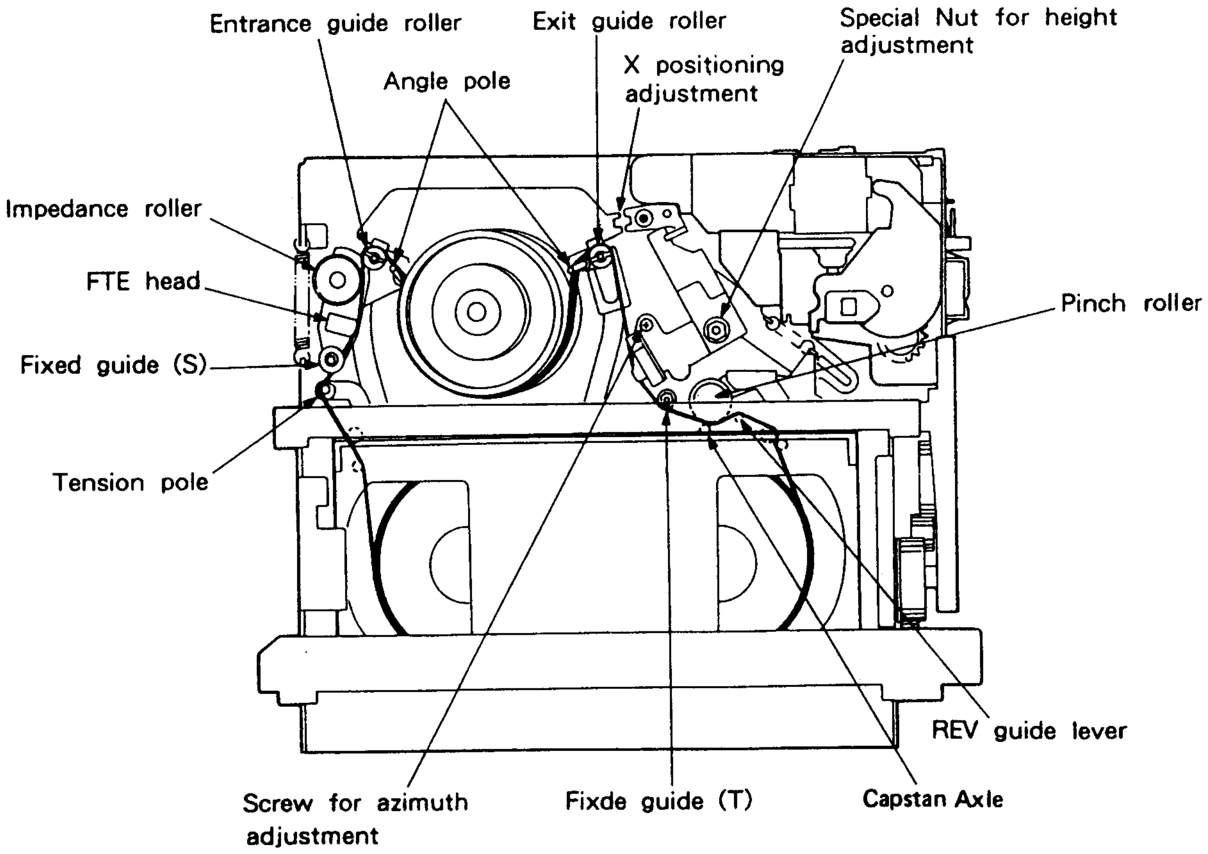

Entrance guide roller
Exit guide roller
Special Nut for height adjustment
Angle pole
X positioning adjustment
Impedance roller
FTE head
Fixed guide (S)
Tension pole
Pinch roller
REV guide lever
Screw for azimuth adjustment
Fixde guide (T)
Capstan Axle

Fig.12-3-5. **Preparation for Adjustment**

(2) ADJUSTMENT BY VISUAL OBSERVATION AFTER GUIDE ROLLER OR COMPL HEAD BRACKET REPLACEMENT

Perform this adjustment after removing or replacing any of the above parts. Only for the replaced or removed parts, play back an alignment tape (VHJ-0009) beforehand and adjust height by visual observation.

(1) Guide Rollers (See Fig.12-3-6.)
The tape should not be curled by the guide roller upper and lower flanges. It should also run smoothly, without moving up and down on the DRUM (CYLINDER) lead surface.

Note: An excessive guide roller pressure may cause tape damage.

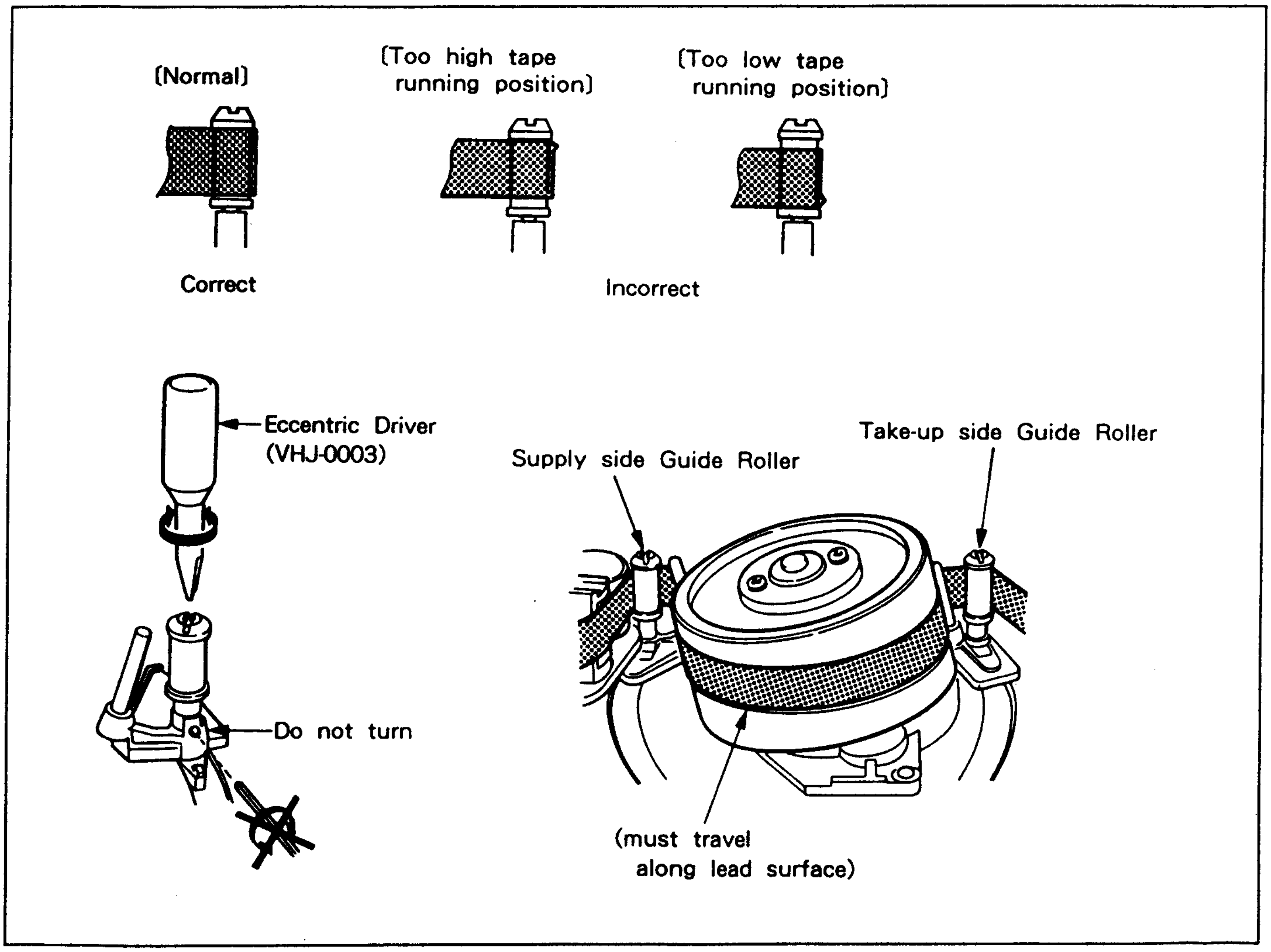

[Normal]
[Too high tape running position]
[Too low tape running position]
Correct
Incorrect
Eccentric Driver (VHJ-0003)
Do not turn
Supply side Guide Roller
Take-up side Guide Roller
(must travel along lead surface)

Fig.12-3-6. **(1) Pre-set for Guide Roller**

COMPL Head Bracket (ACE Head) (See Fig. 12-3-7.) Adjust the ACE Head Height Adjustment nut so that the tape edge runs between the audio head upper end and the control head lower end. Gaps A and B should be of about the same width. Since at this point it is only required that the control signal is picked up and the servo circuit works normally, no adjusting screws except the COMPL HEAD BRACKET special nut should be touched.

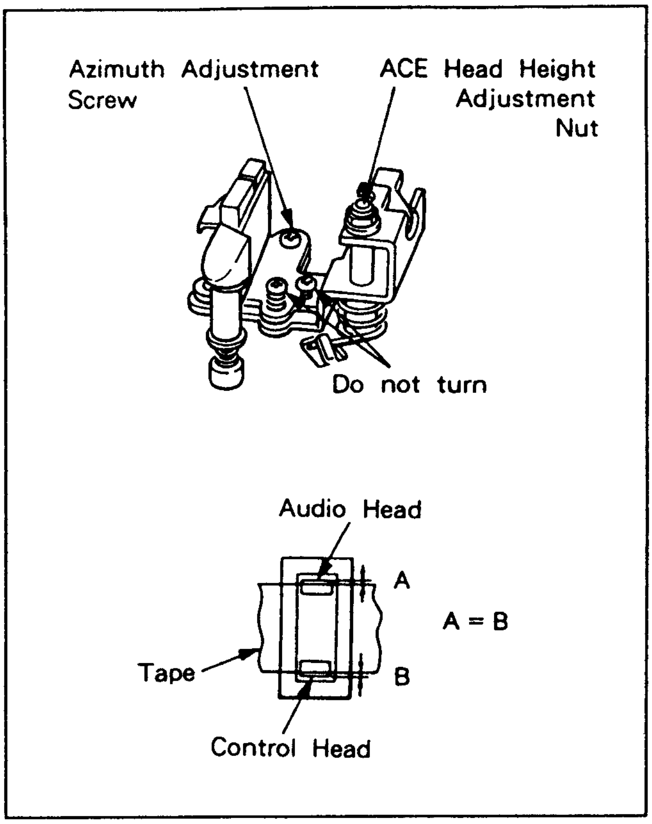

Azimuth Adjustment Screw
ACE Head Height Adjustment Nut
Do not turn
Audio Head
A
A = B
Tape
B
Control Head

Fig. 12-3-7. **(2) Pre-set for Compl Head Bracket**

(3) TAPE PATH CHECK OF ENTRANCE SIDE FIXED GUIDE (S) (See Fig. 12-3-8.)

The fixed guide (S) of the entrance side does not require adjustment in this mechanism.
Confirm that the lower edge portion of the tape is running along the lower flange of the entrance side fixed guide (S).
The tape should not be curled by the entrance side fixed guide (S) upper and lower flanges.

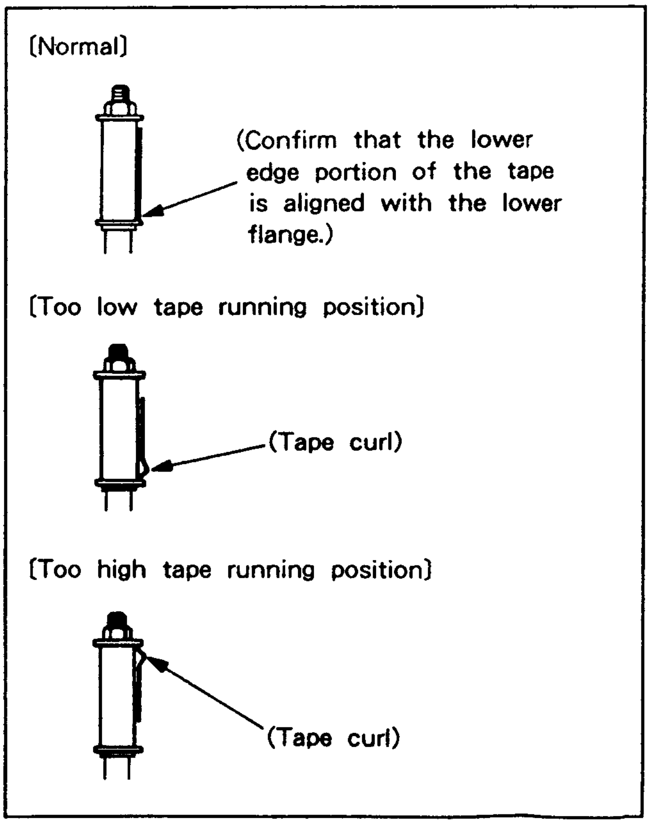

[Normal]
(Confirm that the lower edge portion of the tape is aligned with the lower flange.)
[Too low tape running position]
(Tape curl)
[Too high tape running position]
(Tape curl)

Fig. 12-3-8. **Fixed Guide (S)**

(4) GUIDE ROLLER ADJUSTMENT
(See Fig.12-3-9.)

1) Play back the alignment tape (VHJ-0009), press the tracking control key and adjust the envelope waveform to the maximum level.
2) Loosen the supply side and take-up side guide rollers by rotating them counterclockwise, then rotate them clockwise alternately until a flat video output waveform is obtained.
3) Confirm that the envelope waveform is not deformed. Check visually that no curling occurs at the guide roller upper and lower flanges.
4) Press the tracking control key and set the envelope waveform level to approx. 50% of the maximum. In this condition, confirm whether the envelope waveform is flat. It will, show valleys or peaks at the first half (supply side) or second half (take-up side) if the tape running position is too high or too low.
   In case there is unevenness in the first half (supply side), adjust the entrance side guide roller. If the second half (take-up side) shows trouble, adjust finely the take-up side guide roller.

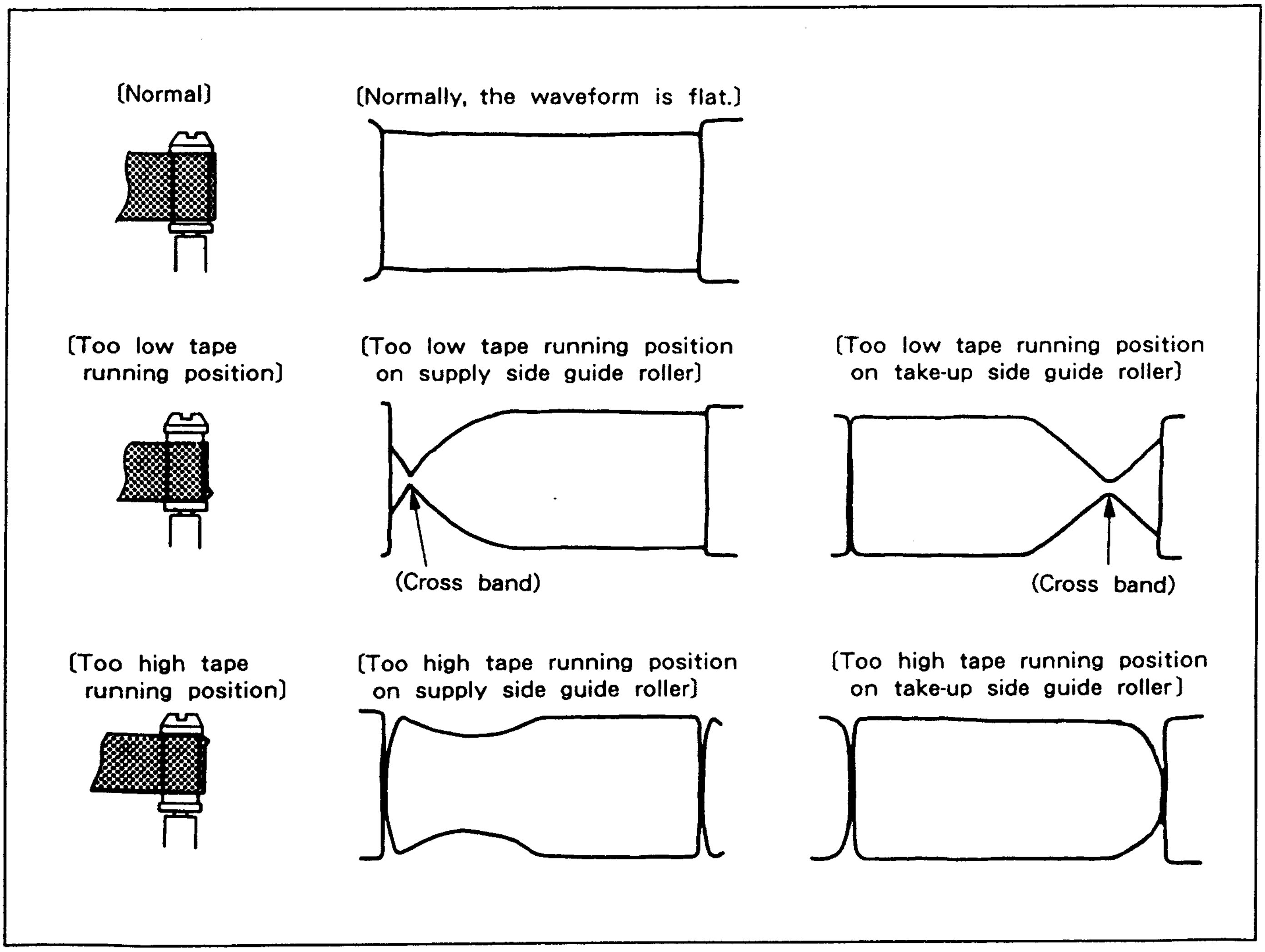

(Normal)
(Normally, the waveform is flat.)
(Too low tape running position)
(Too low tape running position on supply side guide roller)
(Too low tape running position on take-up side guide roller)
(Cross band)
(Cross band)
(Too high tape running position)
(Too high tape running position on supply side guide roller)
(Too high tape running position on take-up side guide roller)

Fig.12-3-9. Guide Roller Adjustment

(5) TAPE PATH CHECK OF EXIT SIDE FIXED GUID (T) (See Fig. 12-3-10.)

The fixed guide (T) of the exit side does not require adjustment in this mechanism.
Confirm that the lower edge portion of the tape is running close to the lower flange of the exit side fixed guide (T).
The tape should not be curled by the exit side fixed guide (T) upper and lower flanges.

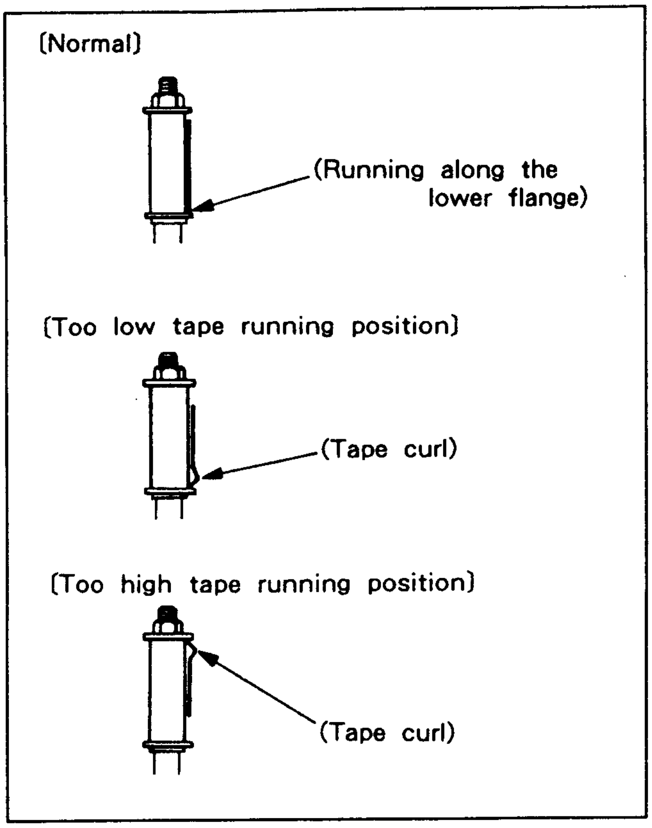

[Normal]
(Running along the lower flange)
[Too low tape running position]
(Tape curl)
[Too high tape running position]
(Tape curl)

Fig.12-3-10. **Fixed Guide (T)**

(6) COMPL HEAD BRACKET (ACE HEAD) ADJUSTMENT

(1) Height Adjustment and Azimuth Adjustment. (See Fig.12-3-11.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Monitor the audio output waveform with the oscilloscope.
3) Rotate the azimuth adjustment screw until the audio output waveform amplitude is maximum.
4) After loosening the ACE head height adjustment special nut, rotate it slowly clockwise until amplitude of the audio output waveform is maximum, then adjust it finely clockwise to the point just before the said waveform amplitude begins to decrease.
5) Rotate the azimuth adjustment screw until amplitude of the audio output waveform is maximum.
6) Confirm that the audio output waveform amplitude does not fluctuate.

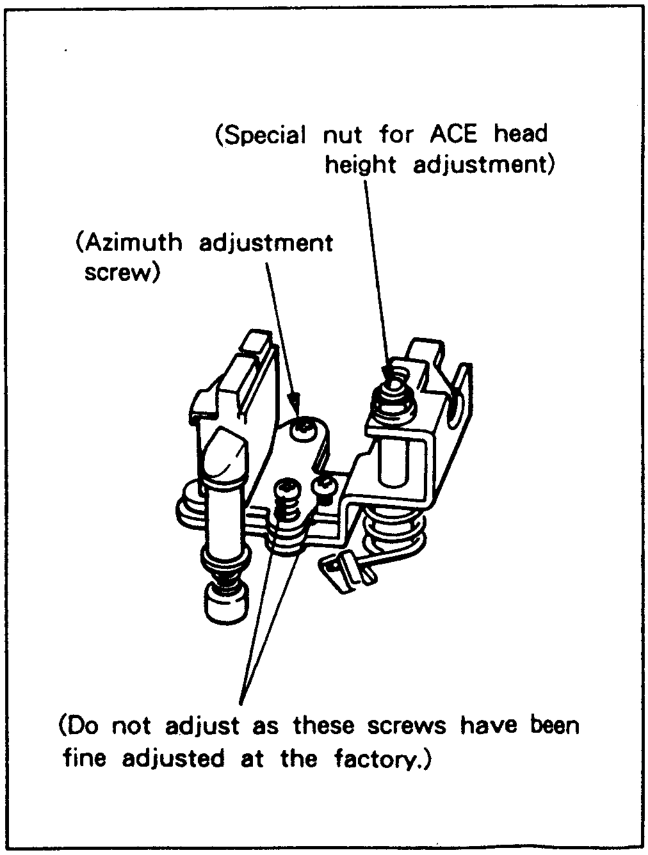

(Special nut for ACE head height adjustment)
(Azimuth adjustment screw)
(Do not adjust as these screws have been fine adjusted at the factory.)

Fig.12-3-11. **Compl Head Bracket**

(2) Tracking (X Value) Adjustment (See Fig. 12-3-12.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Set tracking to the center position with the tracking control key (See Note below).
3) Rotate the stopper bracket fixing screw 180° counterclockwise.
4) Monitor the video head output envelope waveform with the oscilloscope.
5) Adjust the stopper bracket position so that amplitude of the envelope waveform becomes maximum at the tracking center and the envelope waveform amplitude changes by the same amount when shifting the tracking center by pressing the plus (+) and minus (−) tracking control keys.
6) Tighten the fixing screw.
7) (Model for LP mode tape speed capability) Playback the alignment tape (VHJ-0052) and set the tracking to the center using a tracking control key.
   Then confirm that the playback picture on screen is normal. If not, Make readjustment by referring to items 1) through 7). To readjust, playback VHJ-0009 and finely adjust the position of the stopper bracket within the range in which the amplitude of the envelope waveform can be held to a maximum.
8) Perform servo circuit PB PHASE (Switching position) adjustment.

Note: For models equipped with auto tracking, always set to the manual tracking mode before adjustment. To confirm the tracking center position, press the tracking keys (+, −) and observe the front panel clock display.
It will read "T − : −"at the tracking center, "T − :, T − − :"when keeping the minus (−) key pressed, and "T : −, T : − − "when keeping the plus (+) key pressed. The time indication will be restored 2 to 3 seconds after the tracking keys are released.

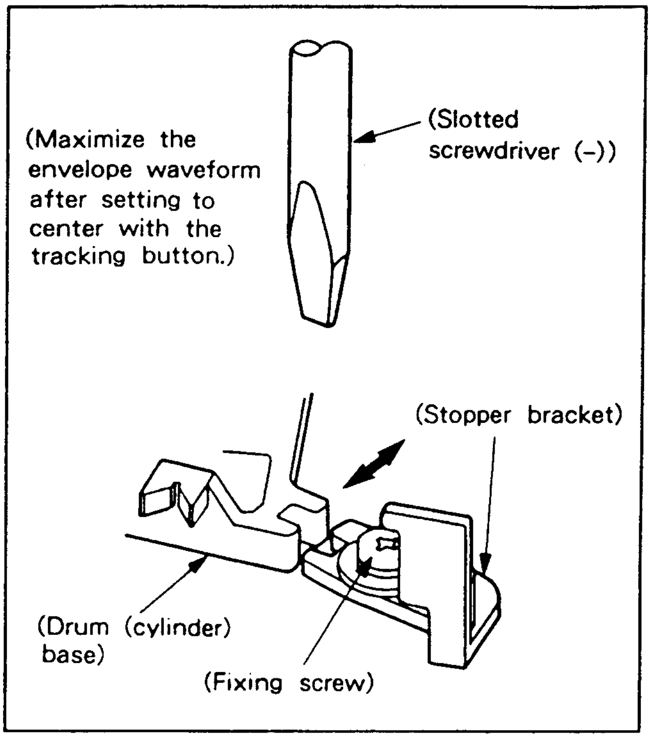

(Maximize the envelope waveform after setting to center with the tracking button.)
(Slotted screwdriver (-))
(Stopper bracket)
(Drum (cylinder) base)
(Fixing screw)

Fig.12-3-12.

(7) CHECKING AFTER ADJUSTMENT

Tape running may show a slight change depending upon the type of the cassette tape (thick or thin tape), the start, middle, or end of cassette tape winding, etc. After performing the tape path adjustment with use of an alignment tape, be sure to check the following points. Incidentally, the alignment tape to be used should be E-180 or E-240 cassette should be a good one without any damage to it.

(1) Try to play back the alignment tape (VHJ-0009) and confirm that the envelope waveform rise immediately and that there is no fluctuation in the envelope waveform and the audio output waveform.

(2) Load a cassette tape E-180 and start recording operation in the standard mode. 1 kHz should be fed to the audio input terminal when recording. After recording, the following points should be checked.

1. When the recorded portion is played back, the envelope waveform rise immediately, and no fluctuation in the envelope waveform is observed. Also, no speed drop occurs during the first half period or the last half period. Further, check to be sure that no fluctuation occurs in the audio waveform. Also confirm that neither the tape curling or derailing is caused on the upper or lower flange and the on the read side of the drum.
2. Confirm that no tape curling or derailing occurs in the upper or lower flange of each tape guide and the read side of the drum during each mode of operation, namely, FF, REW, F. SEARCH, and R. SEARCH.
3. Confirm that the envelope waveform rise immediately after changing the mode directly to the PLAY from each mode of FF, REW, F. SEARCH, R. SEARCH, or POWER OFF (INITIAL) and that no tape curling or derailing occurs in the upper or lower flange of the each tape guide and on the read side of the drum.

(3) Load a E-240 cassette tape and perform recording operation in the SP mode. 1 kHz should be fed to the audio input terminal when recording. Now, confirm that the envelope waveform rise immediately upon starting the playback of the recorded portion, and that neither fluctuation in the envelope waveform nor a speed drop occurs during the first half period or the last half period. Also confirm that no tape curling or derailing is caused in the upper or lower flange of each tape guide and on the drum lead surface.

(4) Perform recording for 60 seconds in the SP mode at the start of E-240 cassette winding. Play back the recorded portion and repeat the F.SEARCH ↔ R.SEARCH ten times, following which confirm that no damage is done to the tape edge. If any damage is found on the tape edge, a proper step must be taken as below depending upon the symptom obserbed.

1. When a sawtooth shaped damage is caused on underside of the tape edge by the REV guide
   1) Check to see if damage is done to the tape by the REV guide.
   2) Loosen the tilt adjustment screw of the ACE head bracket by turning it 135° counter-clockwise.
   3) Make readjustment of the ACE head bracket (azimuth, height and adjustment of X value) by referring to P.197.
   4) Confirm that no fluctuation in the audio level is caused by loosening the tilt adjustment screw in steps 1) and 2) above. Move the screw a little back if any fluctuation is found (but never move it back to the original position). After adjusting the tilt adjustment screw is readjusted, perform step 4) once again.
   5) Confirm again that the E-240 cassette tape does not sustain any damage.
   6) Perform the recording and playback on the E-180 and E-240 cassette tape and confirm that no fluctuation occurs in the envelope waveform and the audio waveform.

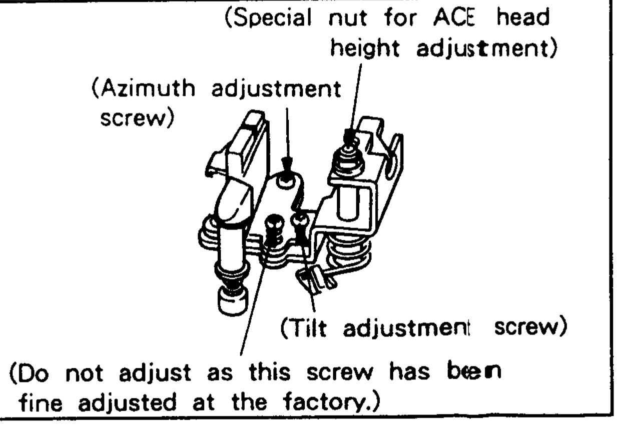

(Special nut for ACE head height adjustment)
(Azimuth adjustment screw)
(Tilt adjustment screw)
(Do not adjust as this screw has been fine adjusted at the factory.)

Fig.12-3-13. Compl Head Bracket

2. If damage in the form of a sawtooth or a streak is found on the tape edge
   1) Check if a large amount of magnetic particles is adhered to the exit-side guide roller. If magnetic particles cannot be removed in spite of repeated cleaning, the guide roller must be replaced.
   2) Confirm if the tape is held too tightly by the exit-side guide roller, or if the last half of the envelope waveform is flat. If the type is found held too tightly, readjustment should be made by referring to 12-3-4.
   3) Recheck if the damage is still caused on the E-240 tape.
      If similar damage is still found on the tape, the exit-side guide roller should be loosened about 20° counterclockwise.
   4) Check once again that no fluctuation is caused in the envelope waveform or the audio waveform by loosening the exit-side guide roller. To do this, record and play back the E-240 cassette tape.

(5) Perform recording for 60 seconds in the SP mode at the near end of the E-240 cassette tape. Play back the recorded portion and repeat the F. SEARCH ↔ R. SEARCH ten times, following which a check should be made to see if damage is still done to the tape edge.
If a damage in the form of a sawtooth or a streak is still occurred on the tape edge by the upper lounge of entrance side guide roller, proceed with the step given below.

1. Check if a large amount of magnetic particles is adhered to the entrance-side guide roller. If the magnetic particles cannot be removed in spite of repeated cleaning, the guide roller must be replaced with new one.
2. Confirm if the tape is held too tightly by the entrance-side guide roller, or if the first half of the envelope waveform is flat. If the tape is found held too tightly, readjustment should be made by referring to 12-3-4.
3. Recheck if the damage is still caused on the E-240 tape.
   If the damage is still found on the tape, the entrance-side guide roller should be loosened about 20° counterclockwise.
4. Check once again that no fluctuation is caused in the envelope waveform or the audio waveform by loosening the entrance-side guide roller. To do this, record and play back the E-240 cassette tape.

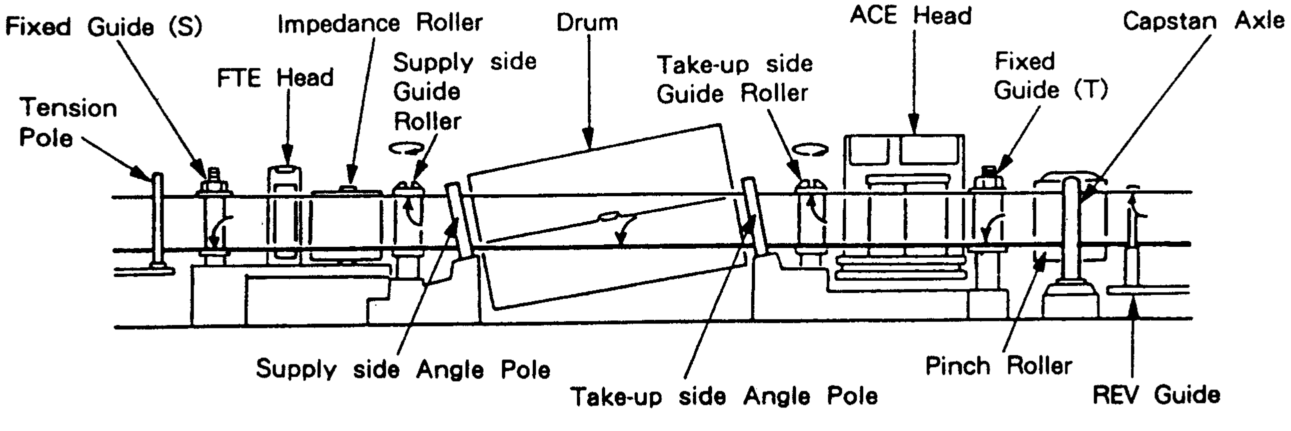
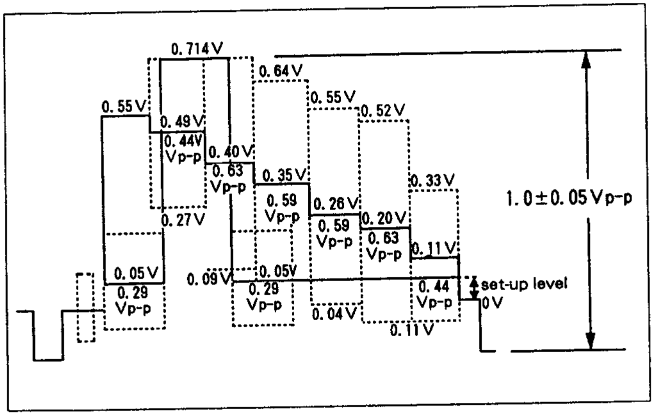


Fig.12-3-14.

13. VIDEO CIRCUIT ADJUSTMENTS

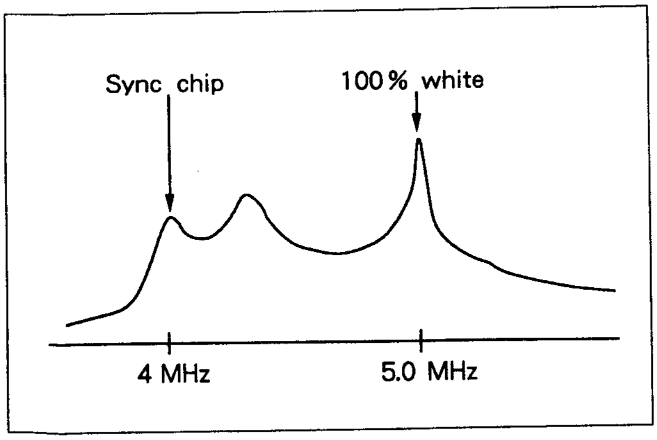
1) AGC LEVEL ADJUSTMENT

Measuring condition : Signal input including 100% white signal (color bar signal), E-E state
Measuring instrument : Oscilloscope
Measuring point : TP221 (TB-1), VIDEO OUT
Adjusting point : VR111
Adjusting method : ① By terminating V. OUT at 75 ohms, the voltage from sync chip to 100% white level is adjusted to 1.0 ± 0.05 Vp-p.


0.714V
0.64V
0.55V
0.55V
0.52V
0.49V
0.44V Vp-p
0.40V
0.63 Vp-p
0.35V
0.33V
0.59 Vp-p
0.26V
0.27V
0.59 Vp-p
0.20V
0.63 Vp-p
0.11V
1.0±0.05Vp-p
0.05V
0.29 Vp-p
0.09V
0.05V
0.29 Vp-p
0.04V
0.44 Vp-p
0.11V
set-up level
0V

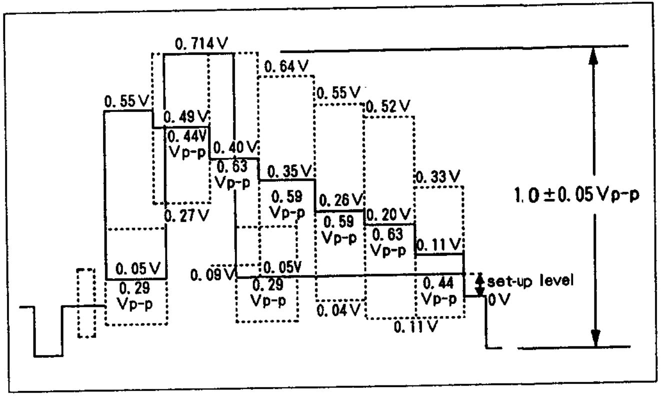
2) DEVIATION ADJUSTMENT

Measuring condition : Signal input including 100% white signal. E-E state
Measuring instrument : Spectrum analyzer
Measuring point : CN101 (pin 7) or TP181 (VP-1) in REC state
Adjusting point : VR112 (deviation), VR113 (carrier)
Adjusting method : ① The sync chip frequency is adjusted to 4.0 ± 0.05 MHz, and the frequency of 100% white signal is adjusted to 5.0 ±0.05 MHz.



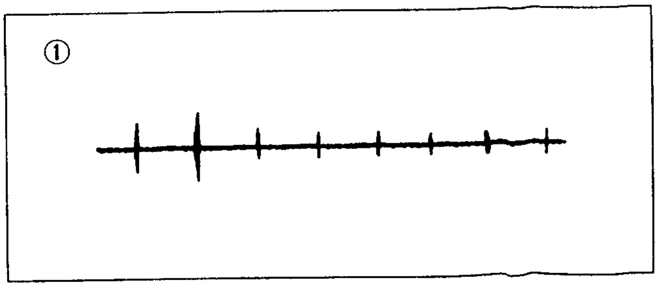
3) PLAYBACK LEVEL ADJUSTMENT

Measuring condition : Self-recording, playback of signal input including 100% white signal (color bar signal)
Measuring instrument : Oscilloscope
Measuring point : TP221 (TB-1), VIDEO OUT
Adjusting point : VR141
Adjusting method : ① By terminating V. OUT at 75 ohms, the voltage from sync chip to 100% white level is adjusted to 1.0 ± 0.05 Vp-p.

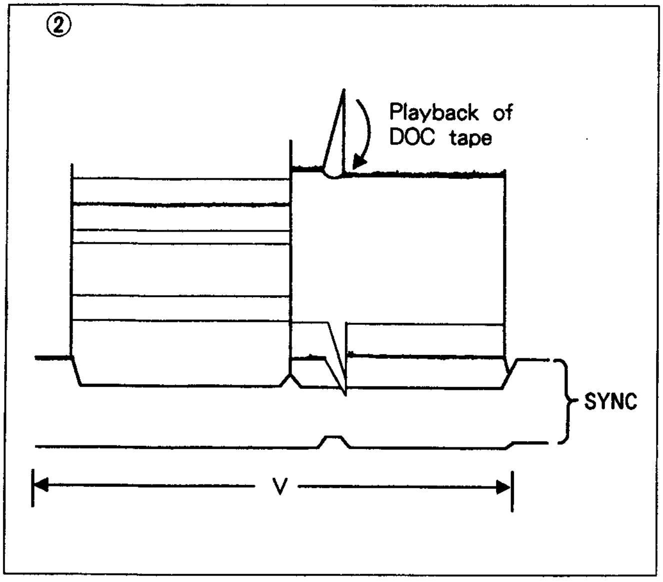

0.714V
0.64V
0.55V
0.55V
0.52V
0.49V
0.44V Vp-p
0.40V
0.63 Vp-p
0.35V
0.33V
0.59 Vp-p
0.26V
0.27V
0.59 Vp-p
0.20V
0.63 Vp-p
0.11V
1.0±0.05Vp-p
0.05V
0.29 Vp-p
0.09V
0.05V
0.29 Vp-p
0.04V
0.44 Vp-p
0.11V
set-up level
0V

4) NOISE CANCELLATION LEVEL ADJUSTMENT

Measuring condition : ① Playback of standard playback tape (VHJ-0008 or self-recording, playback)
② DOC tape playback
NTSC···NX-S704M
PAL···PC-S1D
Measuring instrument : ① Oscilloscope
② DOC tape and oscilloscope
Measuring point : ① C1118 (−) and J1057
② TP221 (TB-1), VIDEO OUT
Adjusting point : VR161
Adjusting method : ① Holding C1118 (−) in CH1, J1057 in CH2, one of the channels is inverted in the same range, using in the add mode, and two signals are summed up to minimize the waveform.

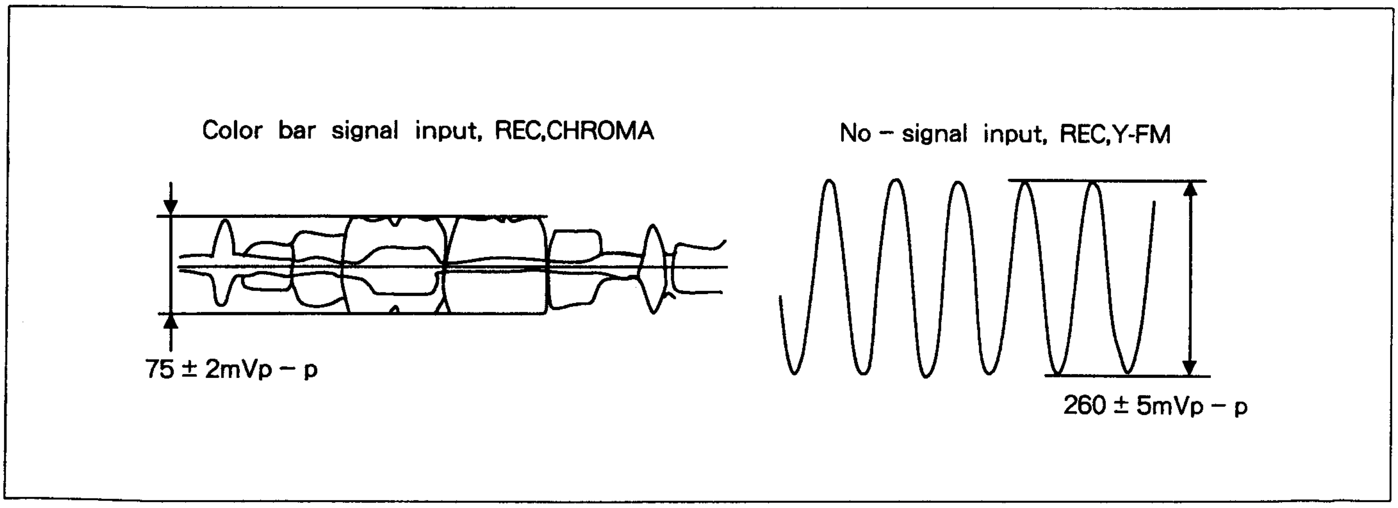


② Observe the waveform of DOC tape playback with an oscilloscope. Maximize the DOC compensating waveform first and then diminish it. Adjust so that the last waveform level may be same as the normal signal.



5) RECORD CURRENT ADJUSTMENT

Measuring condition : Color bar signal input, recorded state. And no-signal input, recorded state.
Measuring instrument : Oscilloscope
Measuring point : TP181 (Inside pre-amp.)
Adjusting point : VR181 (Y), VR182 (Chroma)
Adjusting method : ① In record mode, minimize the Y-FM signal using VR181, and the chroma current is set to 75 ± 2 mVp-p with VR182. In no-signal input mode, set the Y-FM signal to 260 ± 5 mVp-p by rotating VR181.


Color bar signal input, REC,CHROMA

No – signal input, REC,Y-FM

6) PHASE ADJUSTMENT OF REPLACED BURST

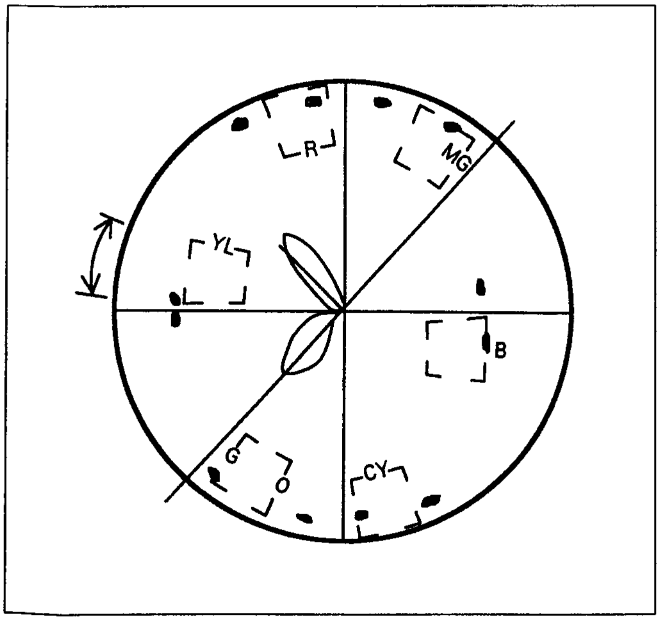
Measuring condition :

Measuring instrument : Vectorscope (equivalent to Techtronics 521A)

Measuring point : VIDEO OUT

Adjusting point : VR171 & CN103 (1, 2, 3, 4 Pin)

Adjusting method :
① Connect Vectorscope to VIDEO OUT, set Vectorscope ϕ REF to BURST, and regenerate color bar signal.
② Connect CN103, 4 Pin (JOG) and CN103 (GND) with a jumper. Connect TP173/CN103, 3 Pin (TH/DL) and CN103, 1 Pin (+5V) with a jumper (TH signal selection). Adjust Vectorscope GAIN and PHASE so that Color bar YL luminance point may be in the normal place on the vectorscope.
③ Unconnect the jumper between TP174 and TP172 in the state of (2) (Burst replacing TH), and adjust VR171 so that Color bar YL luminance point may be within ±5° to the normal place on the vectorscope.



Note) Playback of standard playback TAPE or of Color bar selfrecording tape.

7) PHASE ADJUSTMENT OF DL SIGNAL

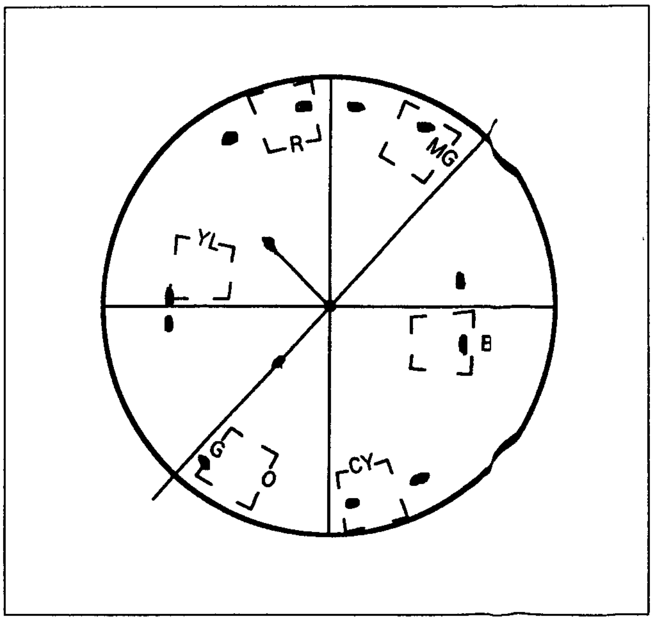
Measuring condition :

Measuring instrument : Vectorscope (equivalent to Techtronics 521A)

Measuring point : VIDEO OUT

Adjusting point : VR172, CN103 (1, 2, 3, 4 Pin)

Adjusting method :
① Connect Vectorscope to VIDEO OUT, set Vectorscope ϕ REF to BURST, and regenerate color bar signal.
② Connect CN103, 4 Pin (JOG), CN103, 3 Pin (TH/DL), and TP172/CN103, 2 Pin (GND) with a jumper (DL signal selection). Adjust Vectorscope GAIN and PHASE so that Color bar YL luminance point may be in the normal place on the vectorscope.
③ Unconnect the jumper from 4 Pin in the state of (2), (Burst replacing DL), and adjust VR 172 so that Color bar YL luminance point may be within ±5° to the normal place on the vectorscope.

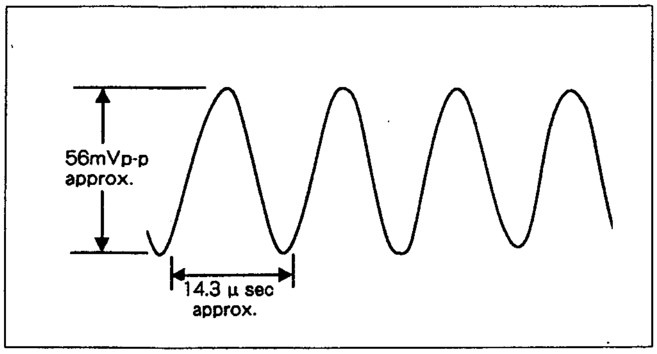


Note) Playback of standard playback TAPE (or Color bar self-recording)

14. AUDIO CIRCUIT ADJUSTMENTS

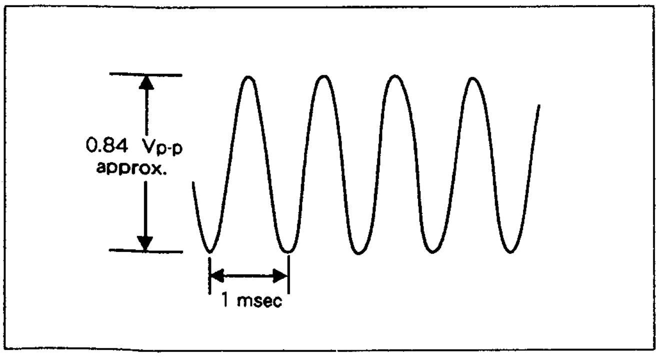
1) ADJUSTMENT OF BIAS, AND CHECKING OF FREQUENCY

Measuring condition : No-signal input, recorded state
Measuring instrument: AC voltmeter, frequency counter
Measuring point : Pins 1, 2 (earth side) of CN202
Adjusting point : VR201
Adjusting method : ① Load with cassette tape, and set the voltage at both ends to 22 mVrms in recorded state. Make sure the oscillation frequency is 70 KHz ± 5 KHz.



2) ADJUSTMENT OF PLAYBACK OUTPUT

Measuring condition : Standard tape (VHJ-0008) is played back.
Measuring instrument: AC voltmeter
Measuring point : Audio output terminal
Adjusting point : VR202
Adjusting method : ① Play back the standard tape (VHJ-0008), and adjust the output voltage to −8 ± 1 dBs.



3) CHECKING OF ALC OUTPUT

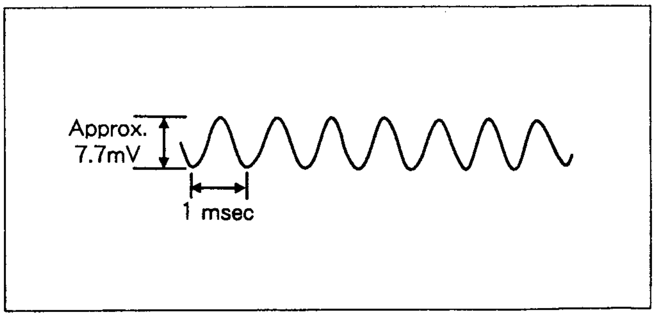
Measuring condition : Reference input (1 KHz), +20 dB, 0, −20 dB
Measuring instrument: AC voltmeter
Measuring point : Audio output terminal
Checking method : ① Feed reference input to the audio input terminal, and wait until the output voltage at audio output terminal is stabilized in E-E mode. Set the input level to −20 dB and +20 dB, and make sure the following standard is satisfied.

Input level	Output level
+20 dB	−6.5± 2 dBs
0 dB	−7±1.5 dBs
−20 dB	−20 ± 4 dBs

Note) The reference input refers to −7 dBs. The input should be applied to both R and L channels.

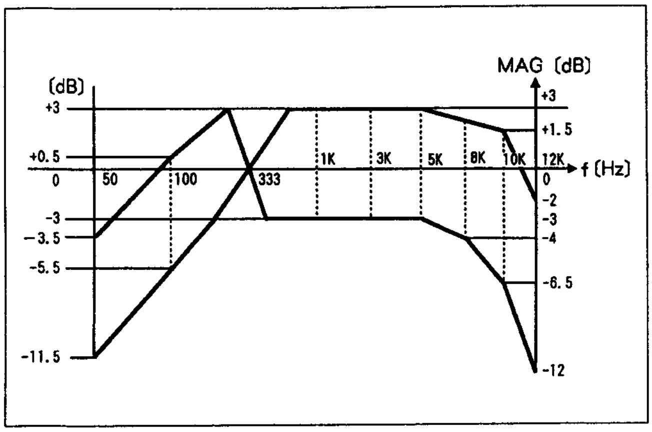
4) CHECKING OF RECORD CURRENT

Measuring condition : 1 KHz reference input, SP recorded state
Measuring instrument: AC voltmeter
Measuring point : TP204, TP203 (earth side)
Adjusting point :
Checking method : ① Short-circuit both ends of C2023 to stop bias, and make sure the record current is 28 ± 5 µArms (2.8 mVrms).



5) CHECKING AND ADJUSTMENT OF OVERALL FREQUENCY CHARACTERISTICS

Measuring condition : Record and playback state in 3H mode at −30 dB from reference input
Measuring instrument: AC voltmeter or frequency response checker
Adjusting point : Audio output terminal
Adjusting method : ① Record and play back in 3H mode, and make sure the frequencies of 50, 100, 333 Hz (400 Hz), 1 KHz, 3 KHz, 5 KHz, 8 KHz, 10 KHz, 12 KHz are in accordance with the following standard.



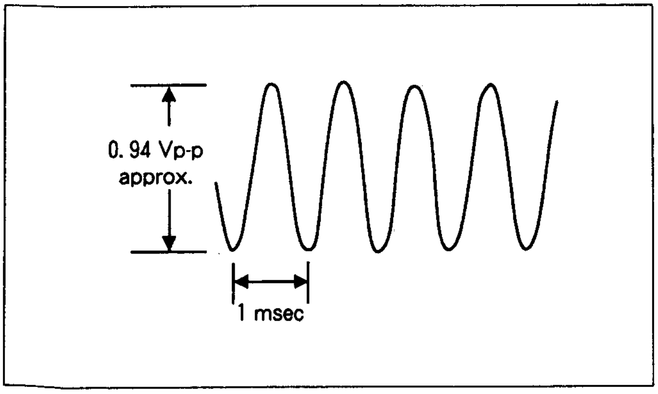
② If the above standard is not satisfied, the bias should be adjusted again.

6) ADJUSTMENT OF RECORD AND PLAYBACK OUTPUT AND CHECKING OF DISTORTION FACTOR

Measuring condition : Reference input (1 KHz), record, playback state
Measuring instrument: AC voltmeter, distortion factor meter
Measuring point : Audio output terminal
Adjusting point : VR202
Adjusting method : ① Feed reference input (1 KHz) to the audio input terminal, and wait until the output of the audio output terminal is stabilized in E-E mode.

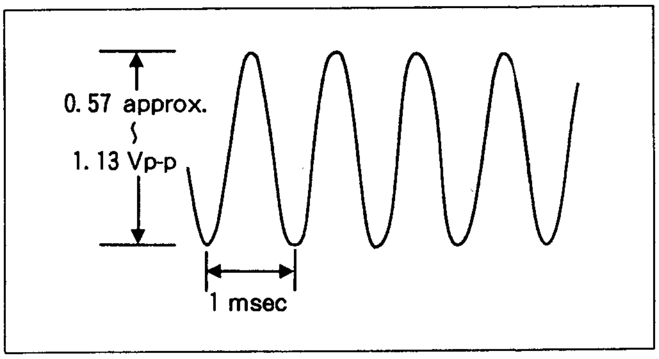
② Record and play back in 3H mode. Adjust VR202 so as to be same as the output of E-E mode (−7 dBs). At this time, make sure the distortion factor is 3.0% or less.

③ If the distortion factor is not satisfied, re-confirm the record current. Also, make sure of the playback output.



7) CHECKING OF LEVEL OF PLAYBACK STANDARD TAPE

Measuring condition : Standard tape (VHJ-0008), playback state
Measuring instrument: AC voltmeter
Measuring point : Audio output terminal
Checking method : ① Play back the standard tape (VHJ-0008), and make sure the output voltage is within −9 + 3.5/−2.5 dBs.



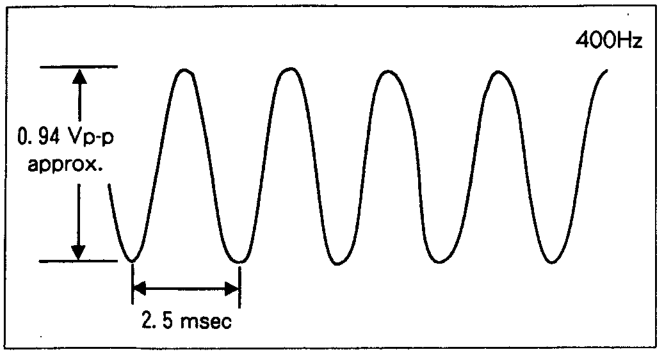
8) OVERALL S/N CHECKING

Measuring condition : No-signal input, recorded state. Record reference input, record no-signal input, and rewind and play back.
Measuring instrument: AC voltmeter
Measuring point : Audio output terminal
Checking method : ① Make sure of 38 dB more in 3H mode

9) ADJUSTMENT OF PLAYBACK OUTPUT IN 12H, 24H MODE

Measuring conditon : Reference input (400 Hz), record, playback state
Measuring instrument : AC voltmeter
Measuring point : Audio output terminal
Adjusting point : VR203 (12H mode), VR204 (24H mode)
Adjusting method : ① Set ON-SCREEN switch to T/D.

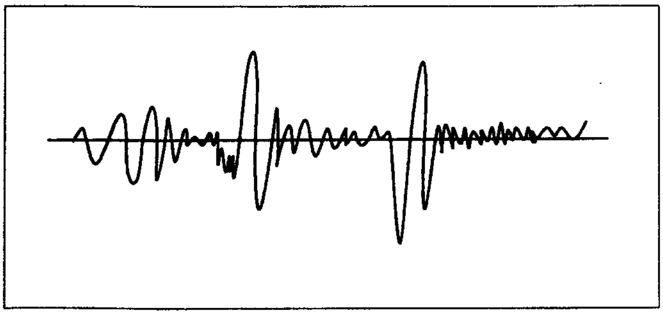
② Feed reference input (400 Hz) to the audio input terminal, record in 12H or mode, play back in the same mode (A12 or A24) as in record, and adjust the playback output level to −7 dBs in each mode.
First adjust in 12H mode, then in 24H mode.



Note : Press the TIMER/AUDIO ON button in 12H mode playback to turn to playback mode A12, and the fluorescent indicating tube indicates A12.

10) MICROPHONE AMPLIFICATION CHECKING

Measuring condition : E-E state
Measuring instrument: Monitor, speaker, microphone
Measuring point : AUDIO OUT terminal
Adjusting point :
Checking method : ① Connect a microphone to the audio output terminal, and make sure that a sound is amplified.

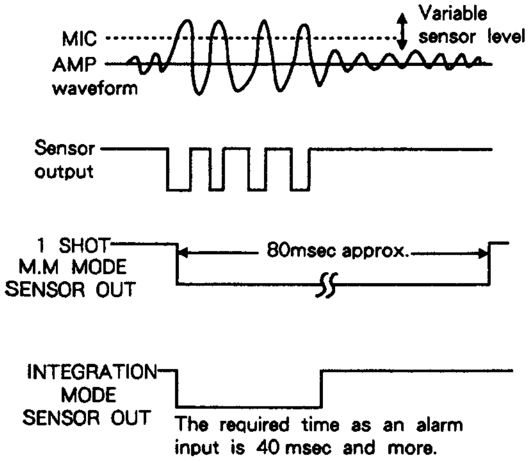


11) AUDIO SENSOR OUTPUT CHECKING

Measuring condition : E-E state, cassette loading state.
Measuring instrument: Monitor, microphone
Measuring point : Monitor screen, ALARM OUT terminal
Adjusting point : VR222 (SENSOR LEVEL VR), S7502 (CP-1 board, SENSOR DURATION)
Adjusting method : ① Short-circuit AUDIO SENSOR terminal and ALARM IN terminal, set ALARM SW to 3H (SPEED) and 1MIN (DURATION), input a loud sound to the microphone, and be sure that the ALARM recording starts.

② Be sure that the ALARM sensor level changes by turning VR222.

③ Be sure that the ALARM recording starts when changing S7502 (CP-1). (Check ALARM OUT is LOW.)
Be that the ALARM recording stops when ALARM RESET terminal and GND terminal are shorted.


MIC AMP waveform
Variable sensor level
Sensor output
1 SHOT M.M MODE SENSOR OUT
80msec approx.
INTEGRATION MODE SENSOR OUT
The required time as an alarm input is 40 msec and more.

VR222 chooses the sensor level of the sound amplified MIC input.

S7502 changes to output the next output to SENSOR OUT.

The fall of sensor output triggers MONOMULTI, and even a keen sound or a single sound can be output for a limited time as an alarm signal.

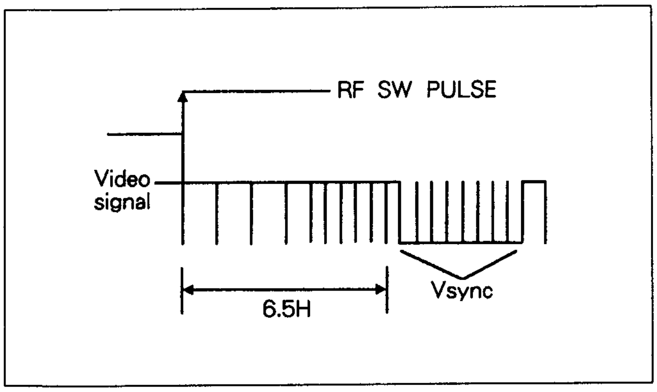
Output period is not certain, as the sensor output is integrated to SENSOR OUT.
Alarm input sensor period is 40 msec at least, and it is used to sensor the loud sound sensored for more than the period.

Note) E-E state, cassette loaded.
Preset at 1 SHOT M.M. side (S7501).

15. SERVO CIRCUIT ADJUSTMENTS

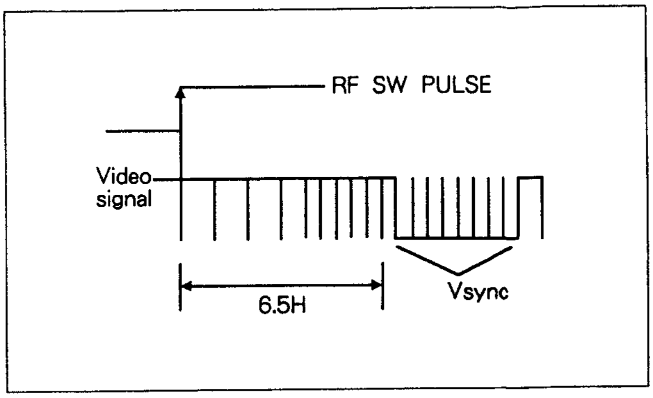
1) ADJUSTMENT OF SWITCHING POSITION

Adjusting condition: Play back PM-S6 tape in 3H playback mode. TRACKING NORMAL control (VR) should be in the center position, where it will click into place.
Measuring instrument: Two-channel oscilloscope
Measuring points : Pre-amp. TP182 (RF SW PULSE) and VIDEO OUT terminal
Adjusting point : VR355
Adjusting value : 6.5 ± 0.5H
Adjusting procedure : ① Trigger upon rise of RF SW-P (pre-amp. TP182), and adjust the VR355 so that the front edge of the vertical sync signal of video signal may be retarded by 6.5 ± 0.5H.



2) CH-2 SWITCHING POSITION CHECKING

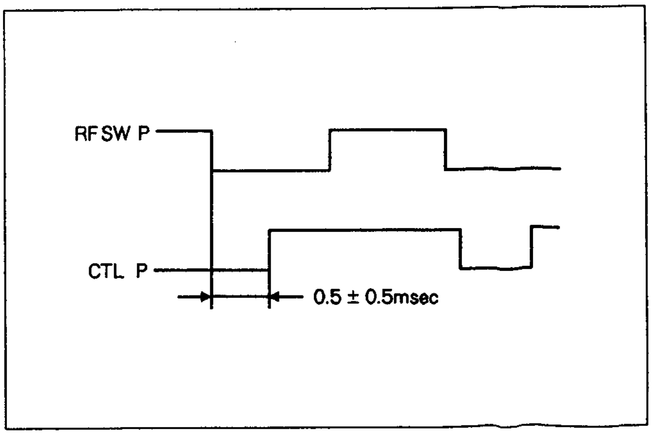
Adjusting condition: Play back VHJ-0009 tape in 3H playback mode. TRACKING NORMAL control (VR) should be in the center position, where it will click into place.
Measuring instrument: Two-channel oscilloscope
Measuring points : Pre-amp. TP182 (RF SW PULSE) and VIDEO OUT terminal
Adjusting point :
Adjusting value : 6.5 ± 0.5H
Adjusting procedure : Trigger upon fall of RF SW-P, and check that the front edge of the vertical sync signal of video signal may be retarded by 6.5 ± 0.5H.



Note : Be sure that the phase difference between CH-1 and CH-2 switching position is within 0.5H.

3) CH-3 TRACKING ADJUSTMENT

Measuring condition : Play back VHJ-0009 tape in 3-hour mode (SP mode).
Measuring instrument: Oscilloscope
Measuring point : TP351 (CTL PULSE), PRE AMP TP182 (RF SW PULSE)
Adjusting point : VR353
Adjusting method : ① Be sure that TRACKING NORMAL VR is in the center click.
② If not in the center click, set in it.
③ Trigger upon fall of RF SW PULSE (PRE AMP TP182), and adjust VR353 so that the rise of CTL PULSE may be retarded by 0.5±0.5 msec as compared with the fall of RF SW PULSE.

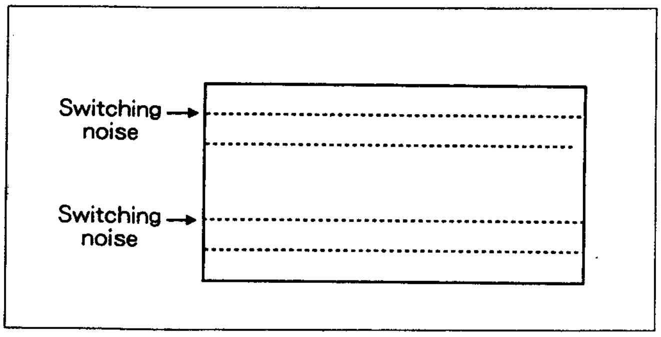


4) REVERSE PLAYBACK TRACKING ADJUSTMENT

Measuring condition : ● Self-recording, playback of monoscope pattern (3-hour mode recording, 3-hour mode reverse playback).

- Wait for approx. 2 sec. until the phase system of the capstan motor is stabilized.

Measuring instrument: Monitor
Measuring point : Monitor screen
Adjusting point : VR354
Adjusting method : ① Be sure that TRACKING NORMAL VR is in the center click.
② If not in the center click, set in it.
③ Adjust finely VR354 so that at tracking center the switching noise may be symmetrical up and down on the monitor screen.

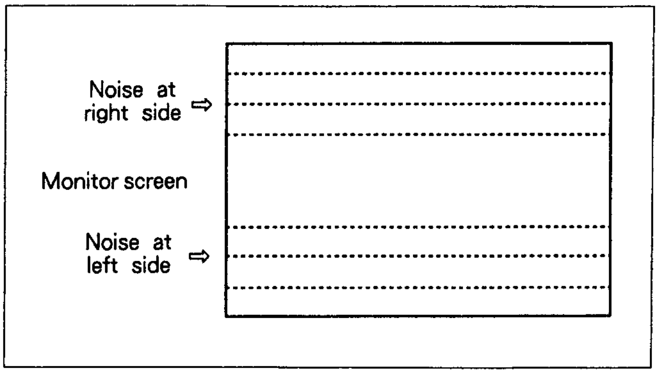


5) STILL V. LOCK ADJUSTMENT IN SP MODE

Measuring condition : Self-recording, playback of monoscope pattern (3-hour playback)
Measuring instrument: Monitor
Measuring point : Monitor screen
Adjusting point : VR221 (STILL V. LOCK VR, TB-1 board)
Adjusting method : ① Adjust STILL V. LOOK VR so that the center of the monitor screen may be stabilized at STILL.

6) BACKWARD SLOW TRACKING ADJUSTMENT IN SP MODE

Measuring condition : Self- recording, playback of monoscope pattern (3-hour mode recording, 12-hour mode reverse playback)
Measuring instrument: Monitor
Measuring point : Monitor screen
Adjusting point : VR352
Adjusting method : ① Adjust VR352 so that at slow tracking center the switching noise on the monitor screen may be put out of the screen.
② Turn TRACKING SLOW VR and be sure that the noise at the left side of the screen and the noise at the right side are symmetrical up and down. If not, adjust finely VR352.



16. TIMER CIRCUIT ADJUSTMENTS

1) CHARACTER SIZE ADJUSTMENT

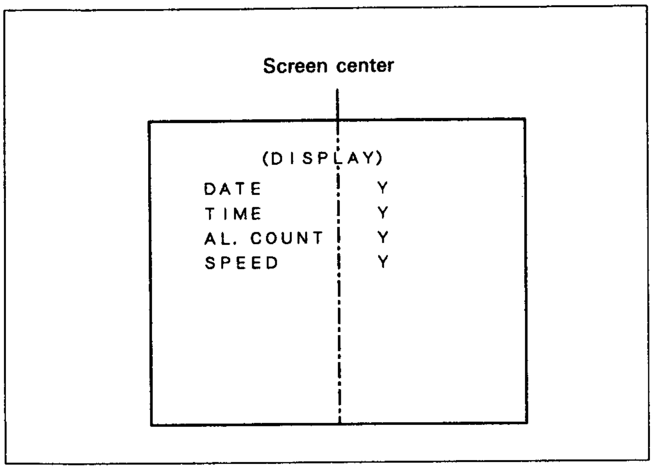
Measuring condition : Video signal input (circular pattern), E-E state

Measuring instrument : Monitor

Measuring point : Position of character on the screen of monitor

Adjusting point : CT741

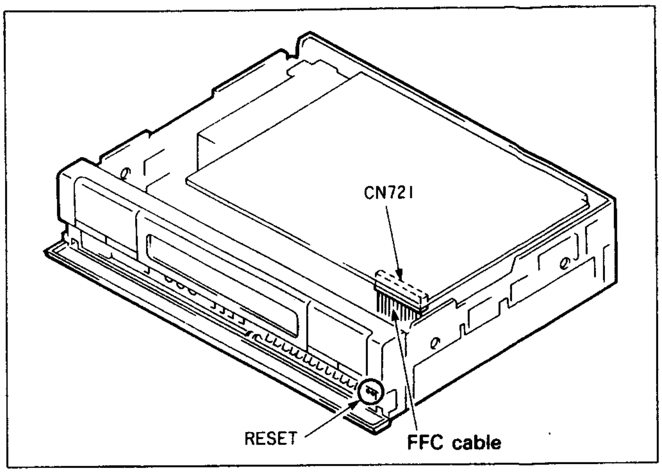
Adjusting method : ① Using ON-SCREEN switch and PAGE button, show the menu 2 screen on the screen, and adjust so that between the character "L" comes to the center of the circular pattern (center in the horizontal direction).



2) CAUTION AT OPENING CABINET

① When opening the cabinet, pull out CN721 FFC cable and cut off + B line of the unit from the Ni-Cd batteries.

② When closing the cabinet, connect CN721 FFC cable and press the RESET button at the right side of the front after POWER ON. If failed, there is a possibility of wrong working of a timer microcomputor when it happens to touch + B line while working at the unit and the voltage of + B line drops. Follow this instruction without fail.



3) E^{2}PROM RESETTING

Measuring condition : ● Video signal input (circular pattern), E-E state
● Be sure to perform this resetting in the final adjusting process.

Measuring instrument : Digital indication panel (fluorescent indicating tube), and monitor

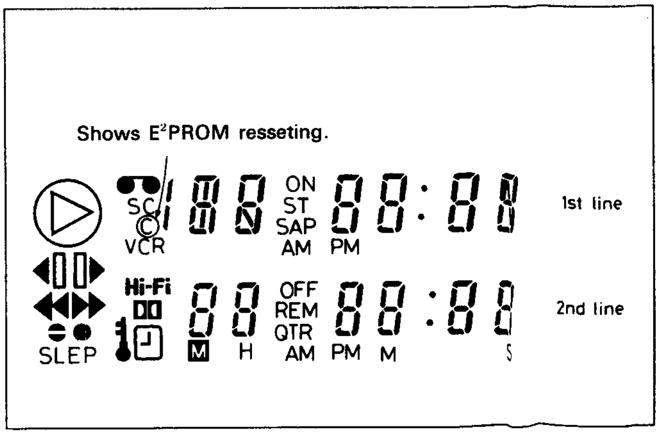
Measuring point : Monitor screen

Adjusting point : CN703 (pins ① & ②)

① POWER ON. and short-circuit CN703 ① Pin, and ② Pin and press the RESET button at the right side of the front panel.

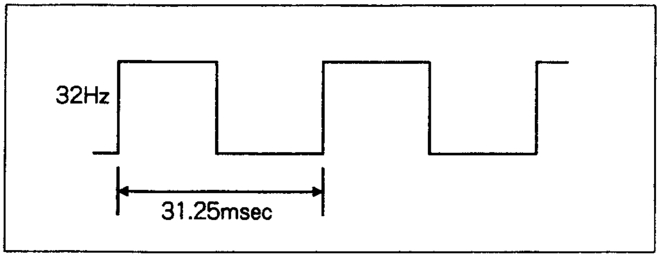
② When E^{2}PROM is reset, be sure that the fluorescent indicating tube "C" character lights. This "C" indication disappears when there is other KEY IN.

③ Be sure that the timer contents of the monitor is cleared.



4) X'TAL FREQUENCY CHECKING

Measuring condition :
Measuring instrument : Oscilloscope, frequency counter (or quartz timer)
Measuring point : J7516
Adjusting point : CN703 (pins ① & ③)
Checking method : ① Short-circuit CN703 ① Pin and ② Pin, and be sure that there goes the BUZZER when pressing and then releasing the RESET button (at the right side of the front panel).
② Be sure that the J7516 frequency is 32 Hz. (or make sure that the frequency is within -3PPM to 16 PPM using a quartz timer.)

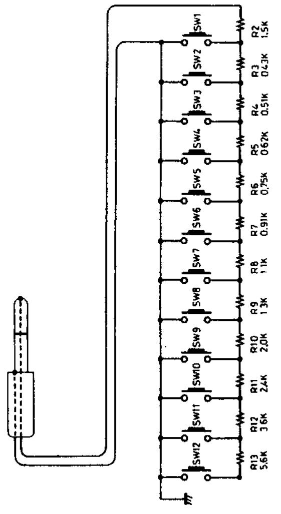

32Hz
31.25msec

5) REMOTE CONTROL CHECKING

Measuring condition : Signal input, E-E state.
Measuring instrument : Remote controller (the circuit added shown in the figure below)
Measuring point :
Adjusting point :
Checking point : ① Load a cassette tape, connect to the REMOTE terminal, and be sure that each operation works well.

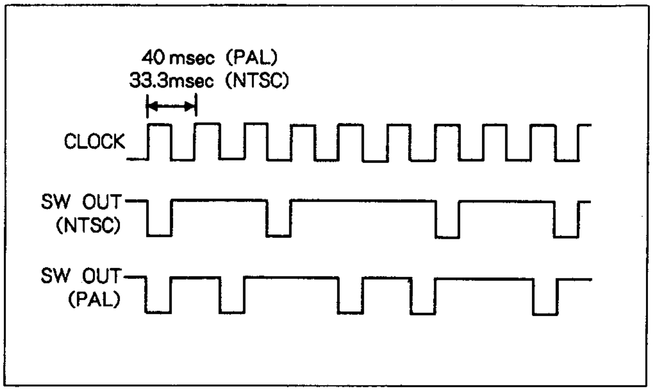
SW1······STOP
SW2······STILL
SW3······REW
SW4······FF
SW5······PLAY
SW6······REC
SW7······PAGE
SW8······SEARCH/RVS
SW9······▲
SW10······COUNTER MEMORY
SW11······⬇
SW12······➡

Resistor tolerance should equal to or less than 2%


SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
R2 1.5K
R3 0.43K
R4 0.51K
R5 0.62K
R6 0.75K
R7 0.91K
R8 1.1K
R9 1.3K
R10 2.0K
R11 2.4K
R12 3.6K
R13 5.6K

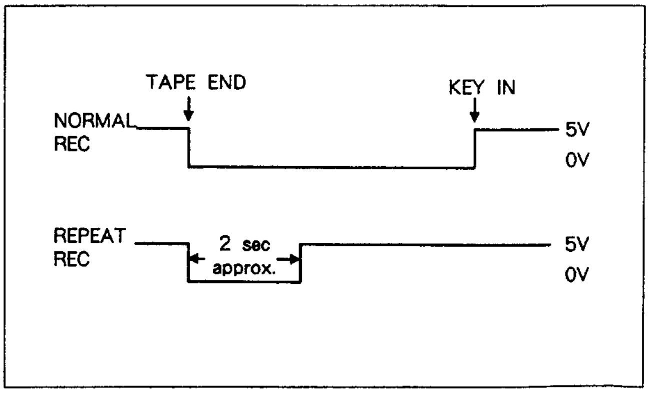
6) CLOCK/SW OUTPUT CHECKING

Measuring condition : Color bar signal input, recorded state in 12-hour mode.
Measuring instrument : Oscilloscope
Measuring point : CLOCK & SW OUT terminals (rear panel)
Adjusting point :
Checking method : ① Load a cassette tape, and be sure that the interval of each waveform is as follows in 12H mode recording.


40 msec (PAL)
33.3msec (NTSC)
CLOCK
SW OUT (NTSC)
SW OUT (PAL)

7) TAPE END OUTPUT CHECKING

Measuring condition : Signal input, recorded state, 3-hour mode.
Measuring instrument : Oscilloscope
Measuring point : TAPE END terminal
Adjusting point :
Checking method : ① Load a cassette tape, and be sure that the waveform of the tape end is as follows in recorded state.

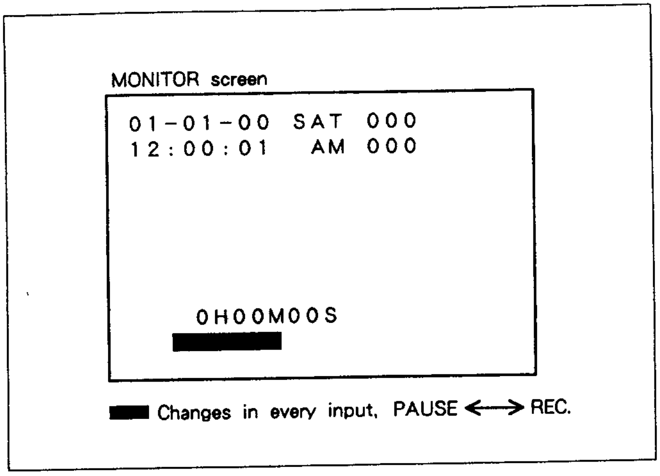

TAPE END
KEY IN
NORMAL REC
5V
0V
REPEAT REC
2 sec approx.
5V
0V

8) 1-SHOT RECORDING CHECKING

Measuring condition : Signal input, recorded state. ("000" indication)
Measuring instrument : Monitor
Measuring point : Monitor screen indication
Adjusting point : 1 SHOT IN/COM terminal (rear panel)
Adjusting method : ① Load a cassette tape, set

the recording speed to 000 to be in recorded state, and be sure of 1-shot recording by every pressing the REC button.

② In the state of 1, be sure of 1-shot recording by shot-circuiting between 1-SHOT IN and COM terminals.


MONITOR screen

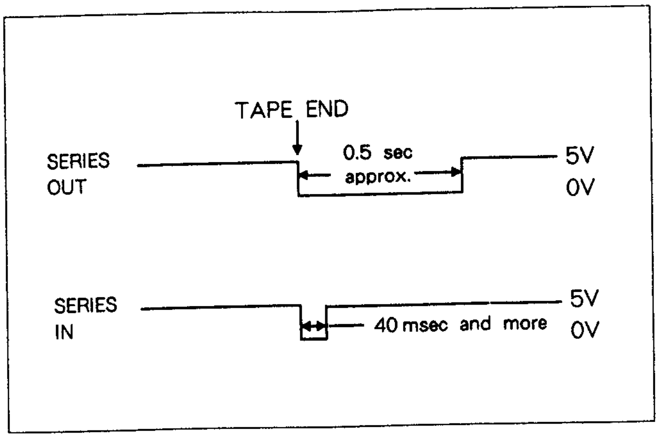
```
01-01-00  SAT  000
12:00:01   AM  000

   0H00M00S
   ▬
```

▬ Changes in every input, PAUSE <—> REC.

Note : Set ON-SCREEN SW to MONITOR, and be sure of the indication.
The indication for 1-shot recording is REC, and the indication for waiting is PAUSE.

9) SERIES RECORDING CHECKING

Measuring condition : Signal input, recorded state.
Measuring instrument : Oscilloscope
Measuring point : Series output terminal
Adjusting point : SERIES IN/COM/OUT terminal (rear panel)
Adjusting method : ① Insert a 120 min tape, record in 3H mode,and be sure of LOW output (SERIES OUT terminal).
② Insert a cassette tape, short-circuit between SERIES IN and COM terminals in E-E state, and be sure that recording starts.



SANYO Electric Co., Ltd.
Osaka, Japan

Aug./ '92/500/MI

Printed by: Schaltungsdienst Lange, Berlin (GERMANY)

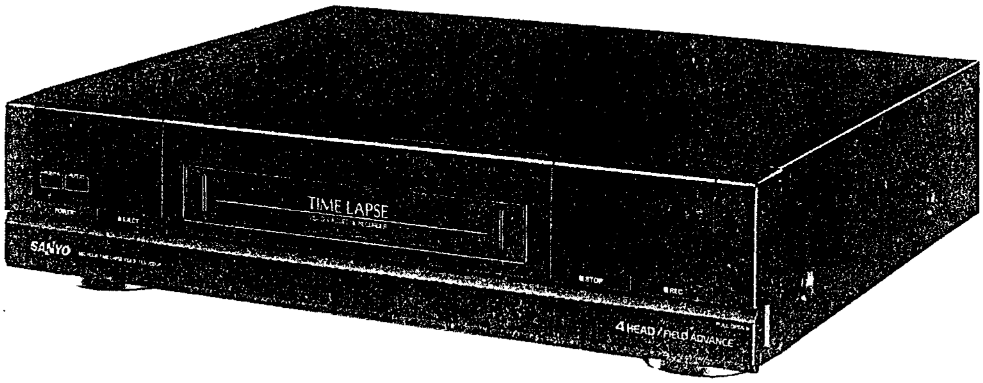
V01863

SANYO

PARTS LIST

Time Lapse Video Cassette Recorder

TLS-2000P


TIME LAPSE
SANYO
STOP
REC
4 HEAD/FIELD ADVANCE

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MC-1 BOARD	23

VP4Q-/SW, E, A

REFERENCE No. WM-550196

PRODUCT SAFETY NOTICE

The components designated by a symbol (⚠) in this schematic diagram designates components whose value are of special significance to product safety. Should any component designated by a symbol need to be replaced, use only the part designated in the Parts List. Do not deviate from the resistance, wattage and voltage ratings shown.

NOTE : Parts order must contain Model Number, Part Number and Description.

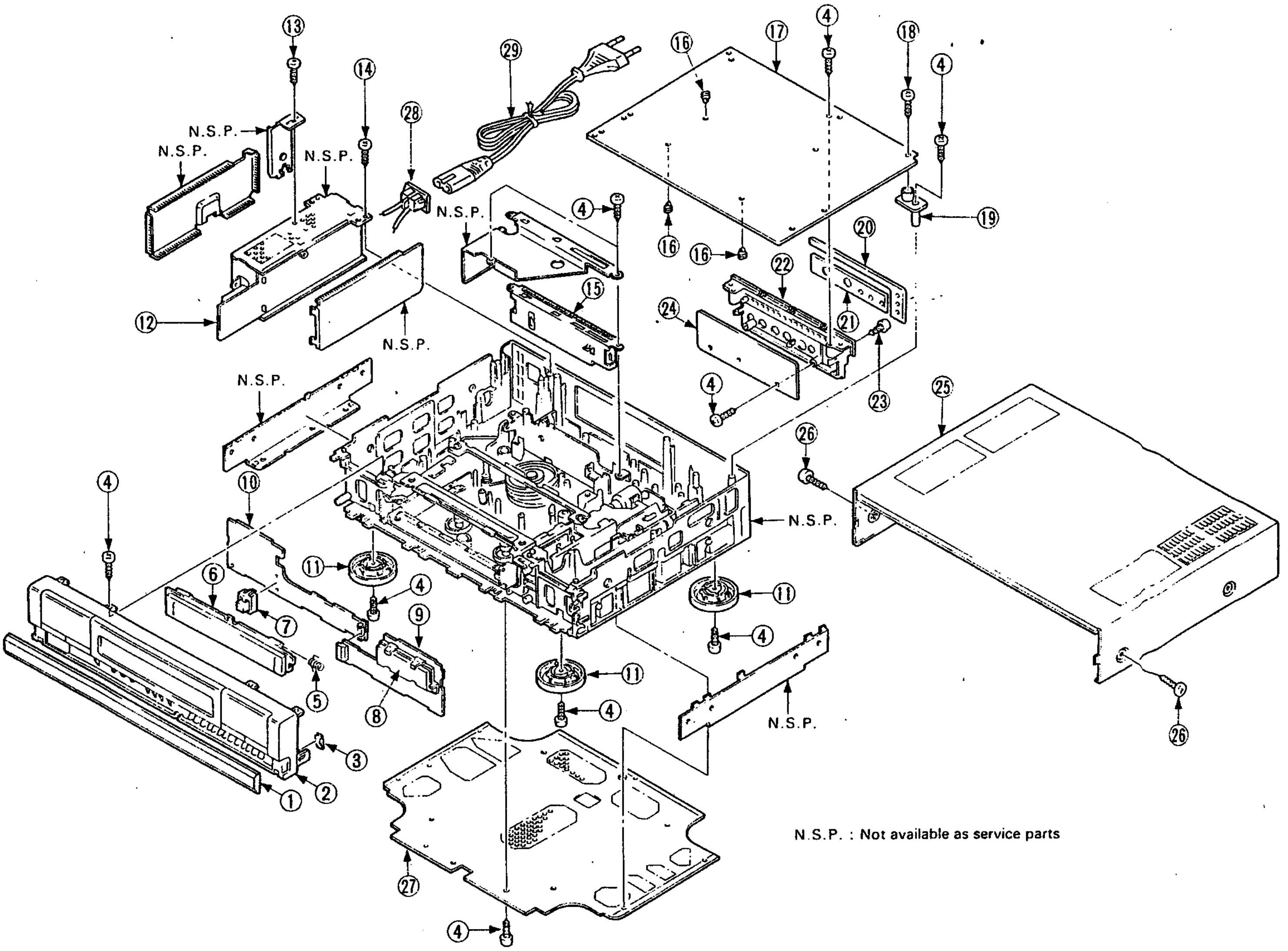
ACCESSORIES & PACKING MATERIALS

Ref. No.	Part No.	Description
	613 133 7855	INSTRUCTION MANUAL
	613 135 3411	CORR CASE, INNER
	613 123 7414	CUSHION INNER, FRONT
	613 123 7421	CUSHION INNER, BACK

CABINET & CHASSIS PARTS

Ref. No.	Part No.	Description
1	613 133 7459	ASSY, DOOR
2	613 133 6865	ASSY CABINET, FRONT
3	613 048 2884	LOCK
4	411 137 0007	SCR L-TPG BIN 3×10
5	613 083 6441	SPRING, DR CASSE-HCD
6	613 129 9627	DOOR, CASSETTE
7	613 130 0033	BUTTON
8	613 118 2110	INDICATOR
9	613 132 1106	COMPL PCB, TM-1
10	613 132 1113	COMPL PCB, TM-2
11	613 123 8916	STAND
12	613 132 3322	COMPL PCB, PW-1
13	411 021 5705	SCR S-TPG BIN 3×6
14	411 021 7907	SCR S-TPG BIN 4×12
15	613 132 1137	COMPL PCB, VP-1
16	613 053 8055	FIXER
17	613 132 1564	COMPL PCB, CP-A
18	411 021 3800	SCR S-TPG BIN 3×10
19	613 122 0089	HOLDER
20	613 130 0057	INDICATOR UPPER
21	613 130 0064	INDICATOR LOWER
22	613 130 0019	TERMINAL
23	411 021 4104	SCR S-TPG BIN 3×12
24	613 138 9458	COMPL PCB, TB-1
25	613 124 2791	COVER, TOP
or	613 124 2807	COVER, TOP
26	412 028 9406	SPECIAL SCREW
27	613 132 3742	COVER, BOTTOM
28	613 137 5055	CONNECTOR, INLET
29	⚠ 613 137 6533	POWER CORD, EUROPE
or	⚠ 613 137 6540	POWER CORD, UK
or	⚠ 613 137 6557	POWER CORD, AUSTRALIA

CABINET & CHASSIS PARTS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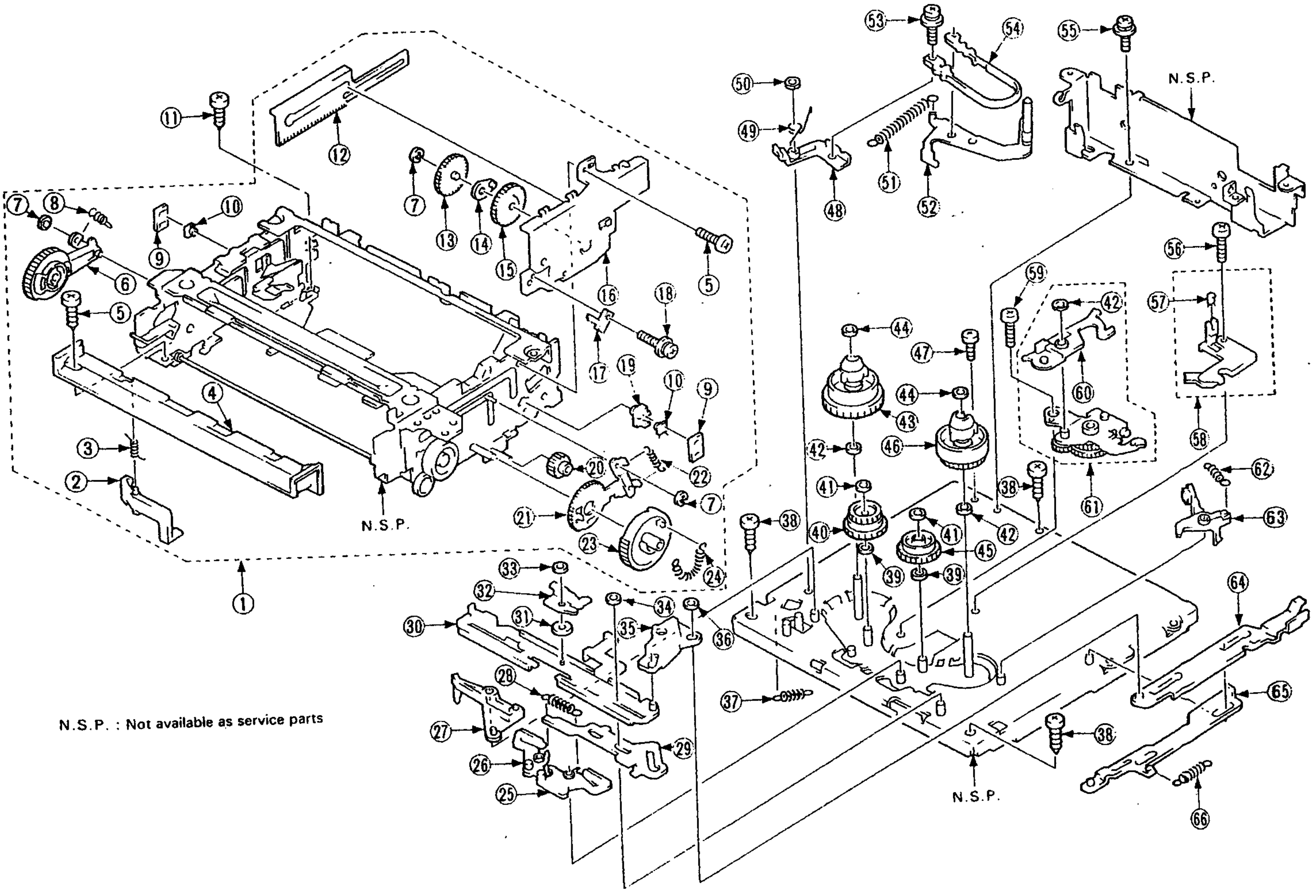
MECHANISM PARTS 1

Ref. No.	Part No.	Description
1	613 136 2260	COMPL, CASSETTE MECHA
2	613 124 5006	LEVER, SAFETY SW
3	613 125 6149	SPRING, SAFETY SW
4	613 108 0256	BOARD, UNDER
5	411 027 1305	SCR S-TPG BIN 2.6×4
6	613 022 0073	ASSY, GEAR LEVER L
7	411 015 9801	RING E 2.3
8	613 022 1643	SPRING, LINK L
9	613 022 0585	LID
10	407 098 3201	PHOTO COUPLER PN150SAN
11	411 001 8702	SCR BIN 3×6
12	613 022 2695	RACK
13	613 022 2633	GEAR, LOCK
14	613 021 9916	ASSY, LEVER PINION
15	613 022 2626	GEAR, PINION
16	613 021 9657	ASSY, BRACKET GEAR
17	613 095 0949	SW, SPECIAL
or	613 006 4479	SPECIAL SWITCH
18	411 106 9208	SCR PAN+SW+W 2×9
19	613 022 0936	HOLDER, TRANSISTOR L
20	613 022 2619	GEAR, IDLER
21	613 022 0097	ASSY, GEAR LEVER R
22	613 022 1674	SPRING LINK R
23	613 022 2596	GEAR, MAIN
24	613 022 1667	SPRING, GEAR MAIN
25	613 095 0222	ASSY, BRAKE, TAKE UP
26	613 080 9216	ASSY, BRAKE, SUPPLY
27	613 084 8871	BRAKE, SUB SUPPLY
28	613 022 1544	SPRING, MAIN BRAKE
or	613 086 2914	SPRING, MAIN BRAKE
29	613 022 2374	SLIDE, ACT BRAKE
30	613 100 4627	ASSY, SLIDE, M PLATE
31	411 130 5009	WASHER, Y 2.1×8×0.2
32	613 099 7432	LEVER, ONE WAY LOCK
33	412 028 3008	SPECIAL WASHER 1.6×4×0.4t
34	411 109 3005	WASHER Y 2.6×5×0.5
35	613 022 2015	LEVER, CONT PLATE
36	412 015 9501	SPECIAL WASHER
37	613 022 1490	SPRING, SUB SUPPLY
38	411 021 7907	SCR S-TPG BIN 4×12
39	412 026 7305	SPECIAL WASHER 2.6×6×0.25
40	613 100 4672	ASSY, GEAR, ONE WAY
41	411 109 1506	WASHER Y 2.1×6×0.25
or	411 109 1407	WASHER Y 2.1×5×0.25
42	412 021 5306	SPECIAL WASHER 3.1×6×0.3
or	412 015 8900	SPECIAL WASHER 3.1×6×0.4
or	412 015 8504	SPECIAL WASHER 3.1×6×0.5
43	613 093 3904	ASSY, REEL, SUPPLY
44	411 109 1605	WASHER Y 2.6×6×0.25
45	613 103 2644	GEAR, REEL TAKE UP
46	613 093 3898	ASSY, REEL, TAKE UP
47	412 030 2402	SPECIAL SCREW
48	613 100 7659	ASSY, LEVER, BRAKE BAND
49	613 105 5728	SPRING, LEVER BRAKE
50	412 015 9600	SPECIAL WASHER
51	613 105 5698	SPRING, LEVER, TENSION
52	613 102 9279	ASSY, LEVER, TENSION
53	411 130 5207	SCR PAN+FLG 2.6×2.4
54	613 100 4573	ASSY, HOLDER, BAND
55	411 046 9702	SCR PAN+SW+W 3×6
56	411 021 3107	SCR S-TPG BIN 2.6×8
57	407 016 7205	LED LN59
58	613 120 9053	COMPL PCB, MC-4
59	412 042 4302	SPECIAL SCREW 2.6×4
60	613 100 4689	ASSY, IDLER
61	613 100 4696	COMPL, IDLER, CLUTCH
62	613 022 1506	SPRING, SUB T
63	613 098 0106	ASSY, BRAKE SUB T
64	613 100 4641	ASSY, SLIDE, ACT PLATE
65	613 021 9992	ASSY, SLIDE, CONT BRAKE
66	613 022 1612	SPRING, RETURN SLIDE

MECHANISM PARTS 1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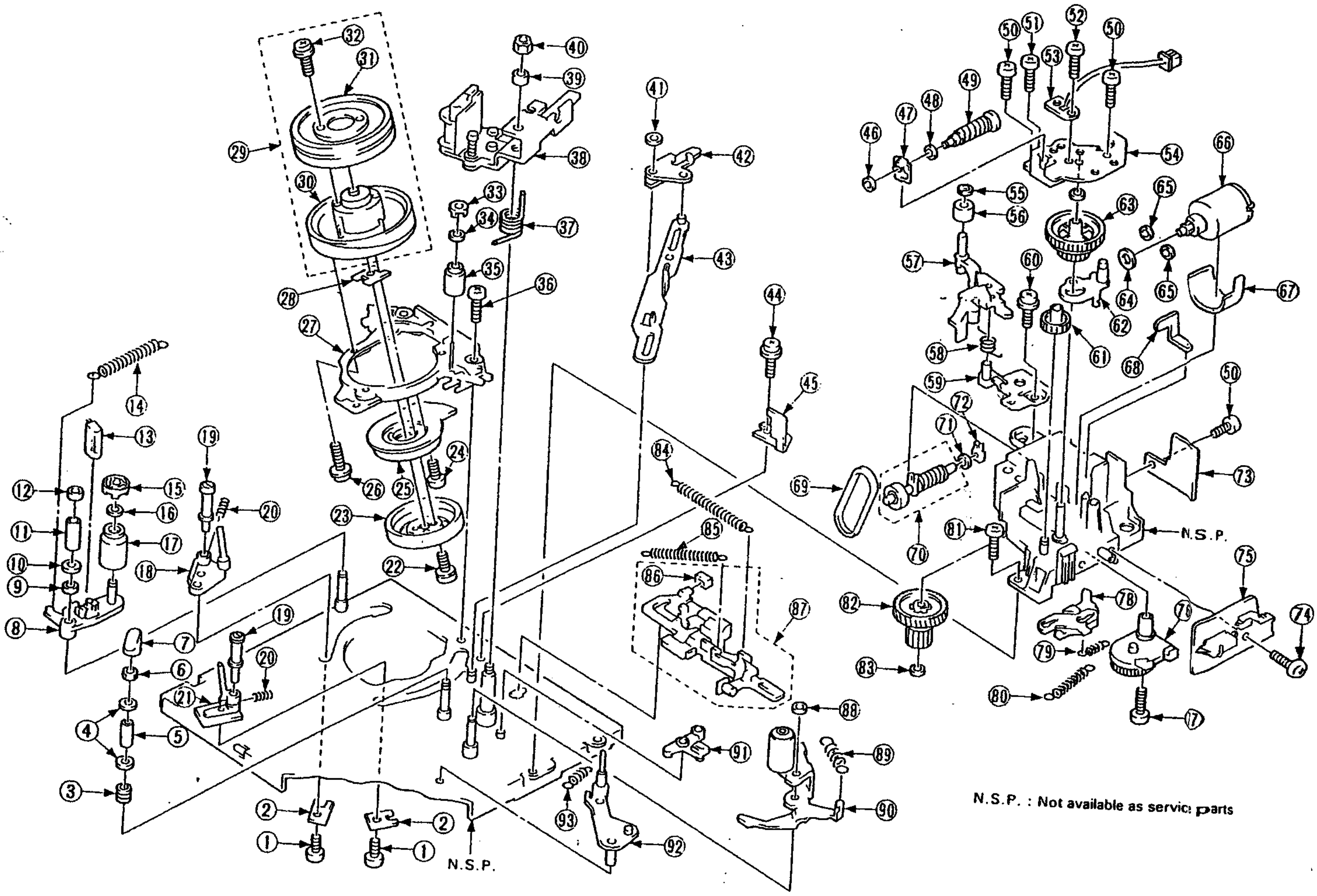
MECHANISM PARTS 2

Ref. No.	Part No.	Description
1	411 031 1209	SCR BIN 2.6×5
2	613 022 1919	PLATE, GUIDE
3	613 022 1766	SPRING, ADJUST GUIDE
4	613 053 3227	SPECIAL WASHER
5	613 058 3307	TAPE GUIDE
6	412 026 2607	SPECIAL NUT (M3)
7	613 123 9418	CAP
8	613 095 3704	ASSY, LEVER, FE HEAD
9	411 109 1704	WASHER Y 6.4×10×0.25
10	613 053 3227	SPECIAL WASHER
11	613 058 3307	TAPE GUIDE
12	412 026 2607	SPECIAL NUT (M3)
13	613 086 7452	HEAD, FULL ERASE
14	613 022 1698	SPRING, ERASE HEAD
15	613 095 3735	BRACKET, IMPEDANCE
16	412 033 3208	WASHER SLIT 1.6×4×0.25
17	613 095 3759	ROLLER, IMPEDANCE
18	613 108 2953	ASSY, BASE, ROLLER S
19	613 022 0233	ASSY, GUIDE, ROLLER
20	411 063 0904	SCR SET HEX-SCT 2×3
21	613 021 9732	ASSY, BASE, ROLLER
22	411 044 9001	SCR PAN+SW 2.3×6
or	412 036 0808	SPECIAL SCREW 2.3×6
23	613 022 4019	ROTOR, MOTOR CYL
24	411 044 8301	SCR PAN+SW 2.3×10
or	411 044 9209	SCR PAN+SW 2.3×8
or	412 036 0709	SPECIAL SCREW 2.3×10
25	613 085 7279	STATOR, MOTOR CYL
26	411 047 5000	SCR PAN+FLG 2.6×8
or	412 030 9708	SPECIAL SCREW 2.6×8
27	613 094 4603	ASSY, BASE, CYLINDER
or	613 121 6556	ASSY, BASE, CYLINDER
28	613 081 4036	SPACER, MOTOR
29	613 133 0139	COMPL, CYLINDER 2N4P-Q
30	613 022 0325	ASSY, CYLINDER, LWR4
31	613 133 0122	ASSY, CYLINDER, UPR 2N4P-Q
32	411 038 1608	SCR PAN+W 3×8
33	613 094 4634	BRACKET, IMPEDANCE
34	411 089 6003	WASHER Y 1.6×3.2×0.25
35	613 094 4764	ROLLER, IMPEDANCE
36	411 047 7509	SCR PAN+FLG 3×6
37	613 022 1797	SPRING, ACE HEAD
38	613 021 9640	COMPL, BRACKET, HEAD
39	613 051 4615	SPACER
or	613 110 1692	SLEEVE, ACE HEAD
40	412 015 8207	SPECIAL NUT (M5)
41	411 109 2008	WASHER Y 3.1×8×0.5
42	613 021 9800	ASSY, LEVER, CAM PINCH
43	613 021 9961	ASSY, SLIDE, ACT PINCH
44	411 120 0007	SCR PAN+SW+W 2.6×5
45	613 120 3631	BRACKET, STOPPER
46	613 053 2381	SPECIAL WASHER
47	613 077 3227	HOLDER, WORM
48	613 027 0382	WASHER
49	613 078 8320	ASSY, WORM, FRONT
50	411 023 2801	SCR S-TPG PAN 2.6×6
51	411 021 3107	SCR S-TPG BIN 2.6×8
52	411 040 2303	SCR PAN 2.6×5
53	613 089 4328	ASSY, SENSOR, DEW
54	613 117 0599	BRACKET, HOLDER
55	411 109 1803	WASHER Y 2.6×6×0.5
56	613 119 8562	ASSY, ROLLER, CLEANER
57	613 142 7396	ASSY, LEVER, CLEANER
58	613 119 8593	SPRING
59	613 119 8524	ASSY, BRACKET, CLEANER
60	411 046 8002	SCR PAN+SW+W 2.6×6
61	613 022 2534	GEAR, FRONT LOAD
62	613 094 1206	ASSY, LEVER, FRONT
63	613 134 2910	GEAR, HELICAL FRONT
64	613 077 3616	DAMPER, WORM
65	613 092 9945	DAMPER, MOTOR
or	613 092 8374	DAMPER, MOTOR
66	613 121 9960	ASSY, LOADING MOTOR
67	613 092 9945	DAMPER, MOTOR
68	613 093 9159	PLATE, NUT
69	613 022 2985	BELT, LOADING
70	613 092 9938	ASSY, WORM, LOAD
71	613 027 0627	WASHER 2.1×6×0.5
72	613 092 5886	HOLDER, WORM
or	613 138 8628	HOLDER, WORM
73	613 107 2732	COMPL, PCB, MC-3
74	411 023 2801	SCR S-TPG PAN 2.6×6
75	613 098 2261	HOLDER, HARNESS
76	613 110 0374	ROTARY SWITCH
77	411 126 5303	SCR PAN 2.6×13
78	613 092 9921	ASSY, SLIDE, FRONT
79	613 092 5985	SPRING, LEVER, LOAD
80	613 092 5992	SPRING, LEVER, ACT
81	411 001 8702	SCR BIN 3×6
82	613 077 3579	GEAR, HELICAL
83	412 033 4106	WASHER SLIT 2.6×5×0.5
84	613 022 1575	SPRING, LINK LOCK
85	613 105 5711	SPRING, SLIDE BRAKE
86	613 022 2725	DAMPER
87	613 100 4603	ASSY, SLIDE, CAM
88	411 109 2107	WASHER Y 3.6×6×0.5
89	613 022 1483	SPRING, PINCH ROLLER
90	613 022 0158	COMPL, PINCH ROLLER
91	613 078 8160	COMPL, LEVER, ACT BRAKE
92	613 102 9293	ASSY, LEVER, REV GUIDE
93	613 022 1568	SPRING, REVIEW LEVER

MECHANISM PARTS 2



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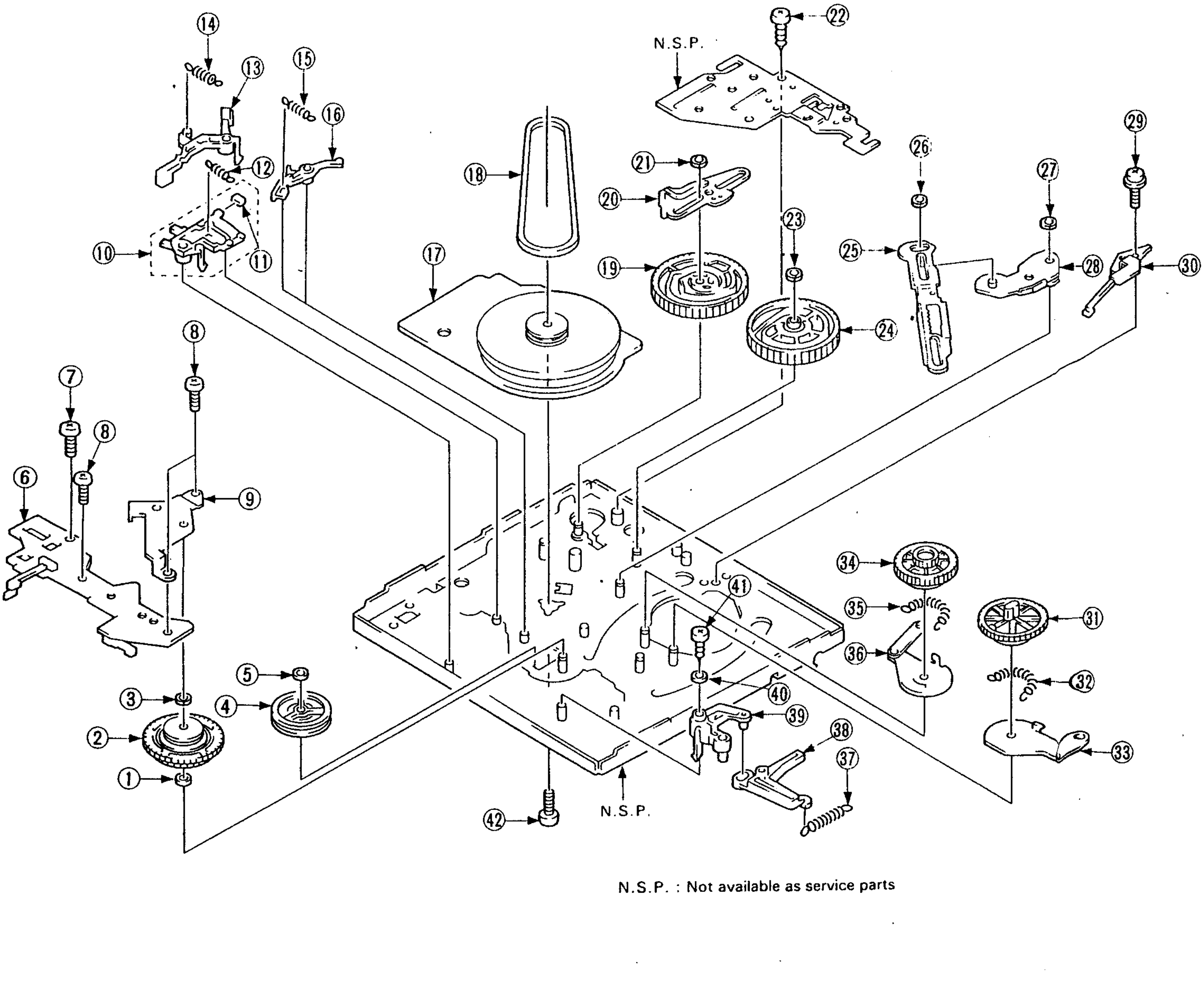
N.S.P. : Not available as service parts

MECHANISM PARTS 3

Ref. No.	Part No.	Description
1	412 015 8603	SPECIAL WASHER 3.1×6×0.25
2	613 100 4665	ASSY, GEAR, FRICTION
3	411 109 1605	WASHER Y 2.6×6×0.25
4	613 103 2651	PULLY, REEL
5	411 109 1605	WASHER Y 2.6×6×0.25
6	613 123 9067	COMPL PCB, MC-1
7	411 100 0300	SCR S-TPG BIN 2.6×5
8	411 021 3107	SCR S-TPG BIN 2.6×8
9	613 103 2538	BRACKET, PULLY
10	613 135 4593	ASSY, LEVER, CLUTCH
11	613 079 1023	DAMPER, LEVER CLUTCH
12	613 022 1520	SPRING, LEVER CLUTCH
13	613 081 7518	ASSY, BRAKE, CAPSTAN
14	613 022 1513	SPRING, CAPSTAN
15	613 022 1711	SPRING, CHANGE CLUTCH
16	613 082 3434	LEVER, CHANGE CLUTCH
17	613 130 9425	MOTOR, CAPSTAN
18	613 093 4031	BELT, REEL DRIVE
19	613 099 7555	CAM, MODE
20	613 021 9978	ASSY, SLIDE, CAM PLATE
21	411 109 2008	WASHER Y 3.1×8×0.5
22	411 021 3107	SCR S-TPG BIN 2.6×8
23	411 109 1902	WASHER Y 3.1×6×0.5
24	613 138 4644	CAM, MAIN
25	613 022 2664	RACK, LOAD
26	411 109 1803	WASHER Y 2.6×6×0.5
27	411 109 2107	WASHER Y 3.6×6×0.5
or	411 109 2206	WASHER Y 3.6×8×0.5
28	613 021 9794	ASSY, LEVER, CAM LOAD
29	411 047 6809	SCR PAN+FLG 3×4
30	613 021 9763	ASSY, EARTH, CYL
31	613 090 6373	GEAR, LOAD S
32	613 022 1704	SPRING, GEAR LOAD S
33	613 021 9862	ASSY, LEVER, LOAD S
34	613 022 2435	GEAR, LOAD TAKE UP
or	613 090 6380	GEAR, LOAD T
35	613 022 1551	SPRING, GEAR LOAD T
36	613 021 9879	ASSY, LEVER, LOAD T
37	613 105 5704	SPRING, REVERSE TENSION
38	613 099 7418	LEVER, RETURN TENSION
39	613 091 3104	ASSY, LEVER CONTROL
40	411 087 6005	WASHER V 2.6×7.5×0.5
41	411 022 8903	SCR S-TPG PAN 2.3×12
42	411 040 2303	SCR PAN 2.6×5

MECHANISM PARTS 3



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N.S.P. : Not available as service parts

ELECTRICAL PARTS

NOTES :

- Materials of capacitors and resistors are abbreviated as follows ;

《Capacitors》
CERAMIC ············ Ceramic Capacitor
POLYESTER ········ Polyester Capacitor
MT-POLYEST ········ Metallized Polyester Capacitor
POLYPRO ············ Polypropylene Capacitor
MT-COMPO ········ Metallized Composite Capacitor
TA-SOLID ············ Tantalum Solid Capacitor
ELECT ················ Electrolytic Capacitor
NP-ELECT ············ Non-Polarized Electrolytic Capacitor
OS-SOLID ············ Aluminium Solid Capacitors With Organic Semiconductive Electrolytic Capacitor
DL-ELECT ············ Double Layered Electrolytic Capacitor

《Resistors》
CARBON ················ Carbon Resistor
OXIDE-MT ············ Oxide Metal Film Resistor
SOLID ···················· Composition Resistor
MT-GLAZE ············ Metal Glaze Resistor
FUSIBLE RES ······ Fusible Resistor

- Value symbols are abbreviated as follows ;

P ························ pF
U ························ μF
UH ···················· μH

- Tolerance of capacitors, resistors and Coils (Inductors) are noted with follow symbols ;

D ·················· ±0.5%
J ······················ ±5%
K ·················· ±10%
M ·················· ±20%
Z ·············· +80-20%

Location	Part No.	Description
	613 134 0732	FLEXIBLE FLAT CABLES, TM-1 ~ CP-1
	613 134 0725	FLEXIBLE FLAT CABLES, PW-1 ~ CP-1

CP-A BOARD

Location	Part No.	Description
	613 132 1564	**COMPL PCB,CP-A**
	613 131 9806	**COMPL PCB,SV-A**
B3501	405 063 9708	TR DTC144EL-TL2
B3502	405 018 2501	TR 2SC3399-AC
B3503	405 018 2501	TR 2SC3399-AC
B3504	405 018 2501	TR 2SC3399-AC
B3505	405 018 2501	TR 2SC3399-AC
B3506	405 018 2501	TR 2SC3399-AC
B3507	405 063 9708	TR DTC144EL-TL2
C3501	403 039 2609	ELECT 47U M 6.3V
C3502	403 121 9509	CERAMIC 0.1U Z 50V
C3503	403 060 7505	POLYESTER 0.033U J 50V
C3504	403 057 2001	POLYESTER 0.1U J 50V
C3505	403 057 2001	POLYESTER 0.1U J 50V
C3506	403 184 9706	MT-POLYEST 0.18U J 50V
C3507	403 057 2001	POLYEST 0.1U J 50V
C3508	403 002 1608	CERAMIC 0.01U J 25V
C3509	403 193 7502	ELECT 22U M 6.3V
C3510	403 193 7502	ELECT 22U M 6.3V
C3511	403 003 1201	CERAMIC 2200P J 25V
C3512	403 002 7006	CERAMIC 1500P J 25V
C3513	403 002 8300	CERAMIC 0.015U J 25V
C3514	403 193 7502	ELECT 22U M 6.3V
C3515	403 193 7502	ELECT 22U M 6.3V
C3516	403 004 3105	CERAMIC 6800P J 25V
C3517	403 004 3105	CERAMIC 6800P J 25V
C3518	403 069 1207	CERAMIC 1000P K 50V

Location	Part No.	Description
C3519	403 069 1207	CERAMIC 1000P K 50V
C3520	403 061 7405	POLYESTER 4700P J 50V
C3521	403 061 7405	POLYESTER 4700P J 50V
C3522	403 059 5109	POLYESTER 0.022U J 50V
C3523	403 039 2609	ELECT 47U M 6.3V
C3524	403 121 9509	CERAMIC 0.1U Z 50V
C3525	403 056 9605	POLYESTER 0.01U J 50V
C3526	403 184 9805	MT-POLYEST 0.22U J 50V
C3527	403 071 6207	CERAMIC 220P K 50V
C3528	403 121 9509	CERAMIC 0.1U Z 50V
C3529	403 057 6900	POLYESTER 0.012U J 50V
C3530	403 004 4607	CERAMIC 0.068U K 25V
C3531	403 057 2001	POLYESTER 0.1U J 50V
C3532	403 056 9605	POLYESTER 0.01U J 50V
C3533	403 057 2001	POLYESTER 0.1U J 50V
C3534	403 039 2609	ELECT 47U M 6.3V
C3535	403 086 2805	NP-ELECT 1U M 50V
C3536	403 001 1906	CERAMIC 0.01U M 16V
C3537	403 086 2805	NP-ELECT 1U M 50V
C3538	403 001 1906	CERAMIC 0.01U M 16V
C3539	403 086 2805	NP-ELECT 1U M 50V
C3540	403 001 1906	CERAMIC 0.01U M 16V
C3541	403 086 2805	NP-ELECT 1U M 50V
C3542	403 001 1906	CERAMIC 0.01U M 16V
C3543	403 121 9509	CERAMIC 0.1U Z 50V
C3544	403 039 2609	ELECT 47U M 6.3V
C3545	403 060 7505	POLYESTER 0.033U J 50V
C3546	403 069 1207	CERAMIC 1000P K 50V
C3547	403 069 1207	CERAMIC 1000P K 50V
C3548	403 162 1609	NP-ELECT 33U M 6.3V
C3549	403 074 9205	CERAMIC 680P K 50V
C3550	403 041 9405	ELECT 10U M 16V
C3551	403 041 9405	ELECT 10U M 16V
C3552	403 184 9805	MT-POLYEST 0.22U J 50V
C3553	403 003 2802	CERAMIC 0.022U K 25V
C3554	403 059 5109	POLYESTER 0.022U J 50V

Location	Part No.	Description
C3555	403 062 9200	POLYESTER 6800P J 50V
C3556	403 003 2802	CERAMIC 0.022U K 25V
C3558	403 071 6207	CERAMIC 220P K 50V
C3559	403 167 6500	ELECT 33U M 6.3V
C3560	403 125 5606	ELECT 100U M 16V
C3561	403 125 5506	ELECT 100U M 16V
C3562	403 041 9405	ELECT 10U M 16V
C3563	403 022 7703	CERAMIC 33P J 50V
C3566	403 069 1207	CERAMIC 1000P K 50V
C3567	403 134 8100	ELECT 100U M 6.3V
C3570	403 069 1207	CERAMIC 1000P K 50V
C3571	403 069 1207	CERAMIC 1000P K 50V
C3572	403 069 1207	CERAMIC 1000P K 50V
C3573	403 069 1207	CERAMIC 1000P K 50V
C3574	403 001 1916	CERAMIC 0.01U M 16V
C3575	403 134 8100	ELECT 100U M 6.3V
D3501	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3502	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3503	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3504	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3505	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3506	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3507	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3508	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3509	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3510	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3511	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3512	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3513	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3514	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3515	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3516	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3517	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3518	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3519	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3521	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77

Location	Part No.	Description
D3522	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3523	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3524	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3525	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3526	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3527	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3528	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3530	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3531	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3532	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
IC351	409 281 1100	IC LC7418-8553
IC352	409 211 0500	IC LC9108B-385
IC353	409 178 3200	IC LA7124
IC354	409 003 9704	IC BU4538B
IC355	409 120 7508	IC BU4053B
IC356	409 111 9801	IC BU4030B
IC357	409 003 9100	IC BU4013B
IC358	409 120 7508	IC BU4053B
IC359	409 207 5809	IC MLC4520B
IC361	409 086 7307	IC LC74HC10
IC362	409 003 9506	IC BU4066B
IC363	409 111 9801	IC BU4030B
Q3501	405 057 6409	TR 2SC4038-R-TL2
Q3502	405 057 6409	TR 2SC4038-R-TL2
Q3503	405 057 6409	TR 2SC4038-R-TL2
R3501	401 017 3709	CARBON 270K JA 1/4W
R3502	401 014 5102	CARBON 15K JA 1/4W
R3503	401 016 8705	CARBON 240K JA 1/4W
R3504	401 014 6000	CARBON 150K JA 1/4W
R3505	401 013 2201	CARBON 110K JA 1/4W
R3506	401 015 3701	CARBON 18K JA 1/4W
R3507	401 012 5609	CARBON 1K JA 1/4W
R3508	401 012 6943	CARBON 10K JA 1/4W
R3509	401 012 5609	CARBON 1K JA 1/4W
R3510	401 012 5609	CARBON 1K JA 1/4W
R3511	401 020 3802	CARBON 470K JA 1/4W
R3512	401 022 4005	CARBON 68K JA 1/4W
R3513	401 014 6000	CARBON 150K JA 1/4W
R3514	401 020 2805	CARBON 47K JA 1/4W
R3515	401 020 2805	CARBON 47K JA 1/4W
R3516	401 019 8623	CARBON 430K JA 1/4W
R3517	401 017 2702	CARBON 27K JA 1/4W
R3518	401 012 8006	CARBON 100K JA 1/4W
R3519	401 012 8006	CARBON 100K JA 1/4W

Location	Part No.	Description
R3520	401 020 7800	CARBON 510 JA 1/4W
R3521	401 022 8003	CARBON 75K JA 1/4W
R3522	401 012 8006	CARBON 100K JA 1/4W
R3523	401 018 4804	CARBON 33K JA 1/4W
R3524	401 012 5609	CARBON 1K JA 1/4W
R3525	401 021 4006	CARBON 56K JA 1/4W
R3526	401 012 4404	CARBON 100 JA 1/4W
R3527	401 012 8006	CARBON 100K JA 1/4W
R3528	401 022 3008	CARBON 6.8K JA 1/4W
R3529	401 013 5202	CARBON 1.2K JA 1/4W
R3530	401 012 6903	CARBON 10K JA 1/4W
R3531	401 012 8006	CARBON 100K JA 1/4W
R3532	401 016 6404	CARBON 2.2M JA 1/4W
R3533	401 020 2805	CARBON 47K JA 1/4W
R3534	401 022 5002	CARBON 680K JA 1/4W
R3535	401 012 8006	CARBON 100K JA 1/4W
R3536	401 012 9201	CARBON 1M JA 1/4W
R3537	401 012 8006	CARBON 100K JA 1/4W
R3538	401 022 7600	CARBON 7.5K JA 1/4W
R3539	401 022 7600	CARBON 7.5K JA 1/4W
R3540	401 016 3700	CARBON 2.2K JA 1/4W
R3541	401 016 3700	CARBON 2.2K JA 1/4W
R3542	401 020 7800	CARBON 510 JA 1/4W
R3543	401 020 7800	CARBON 510 JA 1/4W
R3544	401 018 7508	CARBON 360 JA 1/4W
R3545	401 014 6000	CARBON 150K JA 1/4W
R3546	401 012 8006	CARBON 100K JA 1/4W
R3547	401 012 8006	CARBON 100K JA 1/4W
R3548	401 021 9902	CARBON 620K JA 1/4W
R3549	401 012 8006	CARBON 100K JA 1/4W
R3550	401 016 0402	CARBON 200K JA 1/4W
R3551	401 012 6903	CARBON 10K JA 1/4W
R3552	401 020 1907	CARBON 4.7K JA 1/4W
R3553	401 016 5704	CARBON 220K JA 1/4W
R3554	401 016 5704	CARBON 220K JA 1/4W
R3555	401 012 8006	CARBON 100K JA 1/4W
R3557	401 022 4005	CARBON 68K JA 1/4W
R3558	401 012 8006	CARBON 100K JA 1/4W
R3559	401 020 3802	CARBON 470K JA 1/4W
R3560	401 012 6903	CARBON 10K JA 1/4W
R3562	401 020 3802	CARBON 470K JA 1/4W
R3563	401 012 5609	CARBON 1K JA 1/4W
R3564	401 016 5704	CARBON 220K JA 1/4W
R3565	401 012 5609	CARBON 1K JA 1/4W
R3566	401 017 2702	CARBON 27K JA 1/4W
R3567	401 012 5609	CARBON 1K JA 1/4W
R3568	401 012 5609	CARBON 1K JA 1/4W
R3569	401 012 5609	CARBON 1K JA 1/4W
R3570	401 012 5609	CARBON 1K JA 1/4W
R3571	401 012 5609	CARBON 1K JA 1/4W
R3572	401 012 5609	CARBON 1K JA 1/4W
R3573	401 012 5609	CARBON 1K JA 1/4W
R3574	401 012 5609	CARBON 1K JA 1/4W
R3575	401 012 5609	CARBON 1K JA 1/4W
R3576	401 012 5609	CARBON 1K JA 1/4W
R3577	401 012 5609	CARBON 1K JA 1/4W
R3578	401 012 5609	CARBON 1K JA 1/4W

Location	Part No.	Description
R3579	401 012 5609	CARBON 1K JA 1/4W
R3580	401 012 5609	CARBON 1K JA 1/4W
R3581	401 012 5609	CARBON 1K JA 1/4W
R3584	401 012 5659	CARBON 1K JA 1/4W
R3585	401 012 5609	CARBON 1K JA 1/4W
R3586	401 012 5609	CARBON 1K JA 1/4W
R3587	401 012 5609	CARBON 1K JA 1/4W
R3588	401 012 5609	CARBON 1K JA 1/4W
R3589	401 012 5609	CARBON 1K JA 1/4W
R3590	401 012 5609	CARBON 1K JA 1/4W
R3591	401 012 5609	CARBON 1K JA 1/4W
R3592	401 012 5609	CARBON 1K JA 1/4W
R3593	401 012 5609	CARBON 1K JA 1/4W
R3594	401 012 5609	CARBON 1K JA 1/4W
R3595	401 012 5609	CARBON 1K JA 1/4W
R3596	401 012 5609	CARBON 1K JA 1/4W
R3597	401 020 3802	CARBON 470K JA 1/4W
R3598	401 021 9605	CARBON 62K JA 1/4W
R3599	401 012 6903	CARBON 10K JA 1/4W
R3600	401 020 3802	CARBON 470K JA 1/4W
R3602	401 013 7246	CARBON 120K JA 1/4W
R3603	401 012 5609	CARBON 1K JA 1/4W
R3604	401 012 6903	CARBON 10K JA 1/4W
R3605	401 012 6903	CARBON 10K JA 1/4W
R3608	401 016 6404	CARBON 2.2M JA 1/4W
R3609	401 012 6903	CARBON 10K JA 1/4W
R3701	401 012 4404	CARBON 100 JA 1/4W
R3702	401 012 5609	CARBON 1K JA 1/4W
R3703	401 020 3802	CARBON 470K JA 1/4W
VR351	613 001 9462	SEMI VR 200KB
or	613 112 4868	VR,SEMI 200KB
VR352	613 001 9462	SEMI VR 200KB
or	613 112 4868	VR,SEMI 200KB
VR353	613 001 9462	SEMI VR 200KB
or	613 112 4868	VR,SEMI 200KB
VR354	613 001 9462	SEMI VR 200KB
or	613 112 4868	VR,SEMI 200KB
VR355	613 001 9462	SEMI VR 200KB
or	613 112 4868	VR,SEMI 200KB
	613 131 9844	COMPL PCB,SY-A
C3001	403 135 4101	ELECT 470U M 6.3V
or	403 039 4504	ELECT 470U M 6.3V
C3002	403 121 9509	CERAMIC 0.1U Z 50V
C3003	403 069 1207	CERAMIC 1000P K 50V
C3004	403 159 8109	ELECT 100U M 6.3V
C3006	403 121 9509	CERAMIC 0.1U Z 50V
C3007	403 001 1906	CERAMIC 0.01U M 16V
C3008	403 121 9509	CERAMIC 0.1U Z 50V
C3009	403 140 9207	NP-ELECT 10U M 16V
C3010	403 069 1207	CERAMIC 1000P K 50V
C3011	403 140 9207	NP-ELECT 10U M 16V
C3012	403 069 1207	CERAMIC 1000P K 50V
C3013	403 001 1906	CERAMIC 0.01U M 16V
C3014	403 001 1906	CERAMIC 0.01U M 16V

Location	Part No.	Description
C3015	403 121 9509	CERAMIC 0.1U Z 50V
C3016	403 001 1906	CERAMIC 0.01U M 16V
C3017	403 069 1207	CERAMIC 1000P K 50V
C3018	403 069 1207	CERAMIC 1000P K 50V
C3020	403 069 1207	CERAMIC 1000P K 50V
C3021	403 069 1207	CERAMIC 1000P K 50V
C3035	403 193 8509	ELECT 0.33U M 50V
D3001	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3002	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3003	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3004	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3005	407 007 9904	DIODE GMA01-BT
or	407 012 4406	DIODE 1SS133-T-77
D3006	407 063 9504	ZENER DIODE MTZJ8.2B-T-77
D3007	407 099 5303	ZENER DIODE MTZJ5.6B-T-77
D3008	407 004 9709	DIODE DSK10C-BT
IC301		IC LC66516B-XXXX
IC302	409 073 8003	IC M51953AL
IC303	409 114 4803	IC LB1641
IC304	409 018 3902	IC LA6393D
Q3001	405 019 2807	TR 2SC536-F-SPA-AC
Q3002	405 019 2807	TR 2SC536-F-SPA-AC
R3001	401 023 7807	CARBON 91K JA 1/4W
R3002	401 013 7206	CARBON 120K JA 1/4W
R3003	401 016 3700	CARBON 2.2K JA 1/4W
R3004	401 017 2702	CARBON 27K JA 1/4W
R3005	401 017 3709	CARBON 270K JA 1/4W
R3006	401 023 4509	CARBON 820K JA 1/4W
R3007	402 043 8300	FUSIBLE RES 3.3 JA 1/2W
R3008	401 022 7105	CARBON 750 JA 1/4W
R3009	401 012 6903	CARBON 10K JA 1/4W
R3010	401 012 6903	CARBON 10K JA 1/4W
R3011	401 016 2505	CARBON 220 JA 1/4W
R3012	401 012 6903	CARBON 10K JA 1/4W
R3013	401 020 2805	CARBON 47K JA 1/4W
R3014	401 018 4804	CARBON 33K JA 1/4W
R3015	401 014 7106	CARBON 1.5M JA 1/4W
R3016	401 016 4707	CARBON 22K JA 1/4W
R3017	401 020 2805	CARBON 47K JA 1/4W
R3018	401 018 4804	CARBON 33K JA 1/4W
R3019	401 014 7106	CARBON 1.5M JA 1/4W
R3020	401 016 4707	CARBON 22K JA 1/4W
R3022	401 012 6903	CARBON 10K JA 1/4W
R3023	401 016 0402	CARBON 200K JA 1/4W
R3024	401 016 0402	CARBON 200K JA 1/4W
R3025	401 020 1907	CARBON 4.7K JA 1/4W
R3026	401 012 5609	CARBON 1K JA 1/4W
R3027	401 012 5609	CARBON 1K JA 1/4W
R3028	401 012 5609	CARBON 1K JA 1/4W

Location	Part No.	Description
R3029	401 020 1907	CARBON 4.7K JA 1/4W
R3030	401 020 1907	CARBON 4.7K JA 1/4W
R3031	401 020 1907	CARBON 4.7K JA 1/4W
R3032	401 012 5609	CARBON 1K JA 1/4W
R3033	401 012 5609	CARBON 1K JA 1/4W
R3034	401 012 5609	CARBON 1K JA 1/4W
R3035	401 020 1907	CARBON 4.7K JA 1/4W
R3037	401 012 5609	CARBON 1K JA 1/4W
R3040	401 012 5609	CARBON 1K JA 1/4W
R3041	401 012 5609	CARBON 1K JA 1/4W
R3042	401 012 5609	CARBON 1K JA 1/4W
R3045	401 012 5609	CARBON 1K JA 1/4W
R3046	401 012 5609	CARBON 1K JA 1/4W
R3047	401 012 5609	CARBON 1K JA 1/4W
R3048	401 012 5609	CARBON 1K JA 1/4W
R3049	401 012 5609	CARBON 1K JA 1/4W
R3050	401 012 5609	CARBON 1K JA 1/4W
R3051	401 012 5609	CARBON 1K JA 1/4W
R3053	401 016 5704	CARBON 220K JA 1/4W
R3054	401 016 5704	CARBON 220K JA 1/4W
R3055	401 016 5704	CARBON 220K JA 1/4W
R3056	401 016 5704	CARBON 220K JA 1/4W
R3057	401 012 6903	CARBON 10K JA 1/4W
R3058	401 018 4804	CARBON 33K JA 1/4W
R3059	401 012 5609	CARBON 1K JA 1/4W
R3060	401 012 5609	CARBON 1K JA 1/4W
XF301	613 097 9698	RESONATOR,CERAMIC 4.0MHZ
or	613 124 2142	RESONATOR,CERAMIC 4MHZ
or	613 122 1437	RESONATOR,CERAMIC 4.0MHZ
	613 131 9769	**COMPL PCB,AD-A**
C2001	403 191 8709	ELECT 1U M 50V
C2002	403 074 8703	CERAMIC 680P J 50V
C2004	403 134 5901	ELECT 33U M 16V
C2005	403 002 8201	CERAMIC 0.015U J 25V
C2006	403 135 6204	ELECT 0.33U M 50V
C2007	403 134 5901	ELECT 33U M 16V
C2008	403 004 5505	CERAMIC 8200P K 25V
C2009	403 134 9602	ELECT 47U M 16V
C2010	403 134 5505	ELECT 10U M 25V
C2011	403 134 5901	ELECT 33U M 16V
C2012	403 004 0203	CERAMIC 0.047U J 25V
C2013	403 003 6503	CERAMIC 0.033U J 25V
C2016	403 191 8709	ELECT 1U M 50V
C2017	403 134 9602	ELECT 47U M 16V
C2018	403 107 9905	ELECT 10U M 16V
C2019	403 134 9602	ELECT 47U M 16V
C2020	403 071 5408	CERAMIC 220P J 50V
C2021	403 081 7409	POLYPRO 0.033U J 100V
C2022	403 002 1905	CERAMIC 0.01U K 25V
C2023	403 002 1905	CERAMIC 0.01U K 25V
C2024	403 193 8608	ELECT 0.47U M 50V
C2025	403 167 7002	ELECT 4.7U M 50V
C2027	403 167 7002	ELECT 4.7U M 50V
C2028	403 167 7002	ELECT 4.7U M 50V

Location	Part No.	Description
C2029	403 193 7908	ELECT 3.3U M 25V
C2031	403 167 7002	ELECT 4.7U M 50V
C2032	403 003 5704	CERAMIC 3300P K 25V
C2033	403 134 5901	ELECT 33U M 16V
C2099	403 121 9509	CERAMIC 0.1U Z 50V
D2001	407 012 4406	DIODE 1SS133-T-77
D2002	407 012 4406	DIODE 1SS133-T-77
IC201	409 133 1401	IC LA7294
L2002	613 014 3389	HF CHOKE
or	613 014 3518	HF CHOKE
L2003	613 015 8550	CHOKE COIL 560UH K
Q2001	405 024 9709	TR 2SD734-E-AA
Q2002	405 019 2005	TR 2SC536-E-SPA-AC
Q2003	405 019 2005	TR 2SC536-E-SPA-AC
R2001	401 012 4404	CARBON 100 JA 1/4W
R2003	401 014 2804	CARBON 150 JA 1/4W
R2004	401 020 3802	CARBON 470K JA 1/4W
R2005	401 021 2903	CARBON 5.6K JA 1/4W
R2006	401 015 9406	CARBON 2K JA 1/4W
R2007	401 018 3708	CARBON 3.3K JA 1/4W
R2008	401 020 2805	CARBON 47K JA 1/4W
R2009	401 012 9201	CARBON 1M JA 1/4W
R2010	401 012 6903	CARBON 10K JA 1/4W
R2011	401 016 3700	CARBON 2.2K JA 1/4W
R2012	401 016 3700	CARBON 2.2K JA 1/4W
R2013	401 012 5609	CARBON 1K JA 1/4W
R2014	401 023 6909	CARBON 910 JA 1/4W
R2016	401 012 6903	CARBON 10K JA 1/4W
R2017	401 012 6903	CARBON 10K JA 1/4W
R2018	401 015 3701	CARBON 18K JA 1/4W
R2019	401 015 3701	CARBON 18K JA 1/4W
R2021	401 012 3308	CARBON 10 JA 1/4W
R2022	401 019 9501	CARBON 47 JA 1/4W
R2023	401 014 5102	CARBON 15K JA 1/4W
R2024	401 019 6104	CARBON 4.7 JA 1/4W
R2026	401 020 1907	CARBON 4.7K JA 1/4W
R2027	401 020 1907	CARBON 4.7K JA 1/4W
R2036	401 023 1607	CARBON 820 JA 1/4W
R2037	401 012 8006	CARBON 100K JA 1/4W
R2038	401 012 8006	CARBON 100K JA 1/4W
R2039	401 016 3700	CARBON 2.2K JA 1/4W
T2001	613 016 2205	OSC COIL 70KHZ
VR201	613 001 9455	SEMI VR
or	613 112 4820	VR,SEMI 100KB
VR202	613 001 9417	SEMI VR 10KB
or	613 079 2532	VR,SEMI 10KB
VR203	613 001 9363	SEMI VR
or	613 112 4905	VR,SEMI 500B
VR204	613 001 9363	SEMI VR
or	613 112 4905	VR,SEMI 500B

Location	Part No.	Description
	613 131 9820	**COMPL PCB,VD-A**
B1001	405 018 2501	TR 2SC3399-AC
B1002	405 018 2501	TR 2SC3399-AC
B1201	405 018 2511	TR 2SC3399-AC
B1401	405 018 2501	TR 2SC3399-AC
B1402	405 018 2501	TR 2SC3399-AC
B1501	405 063 9708	TR DTC144EL-TL2
B1502	405 018 2501	TR 2SC3399-AC
B1503	405 018 2501	TR 2SC3399-AC
B1504	405 018 2501	TR 2SC3399-AC
B1505	405 018 2501	TR 2SC3399-AC
B1506	405 018 2501	TR 2SC3399-AC
B1507	405 018 2501	TR 2SC3399-AC
B1508	405 018 2501	TR 2SC3399-AC
B1509	405 003 7603	TR 2SA1345-AC
B1510	405 018 2501	TR 2SC3399-AC
B1511	405 063 9708	TR DTC144EL-TL2
B1601	405 018 2501	TR 2SC3399-AC
C1001	403 150 6500	ELECT 22U M 16V
C1002	403 150 6500	ELECT 22U M 16V
C1101	403 004 4904	CERAMIC 0.068U M 25V
C1102	403 001 1906	CERAMIC 0.01U M 16V
C1103	403 001 1906	CERAMIC 0.01U M 16V
C1105	403 163 7907	ELECT 47U M 6.3V
C1106	403 191 8808	ELECT 2.2U M 50V
C1107	403 193 7502	ELECT 22U M 6.3V
C1108	403 193 7502	ELECT 22U M 6.3V
C1109	403 001 1906	CERAMIC 0.01U M 16V
C1110	403 193 8608	ELECT 0.47U M 50V
C1111	403 121 9509	CERAMIC 0.1U Z 50V
C1113	403 073 2702	CERAMIC 390P J 50V
C1114	403 026 2209	CERAMIC 47P J 50V
C1115	403 026 2209	CERAMIC 47P J 50V
C1116	403 158 5604	NP-ELECT 0.47U M 50V
C1117	403 161 6902	NP-ELECT 2.2U M 50V
C1118	403 193 8608	ELECT 0.47U M 50V
C1119	403 012 6006	CERAMIC 15P J 50V
C1120	403 070 3702	CERAMIC 120P J 50V
C1121	403 068 8801	CERAMIC 100P J 50V
C1122	403 189 2405	ELECT 10U M 16V
C1201	403 004 0203	CERAMIC 0.047U J 25V
C1202	403 049 0800	ELECT 1U M 50V
C1203	403 025 8608	CERAMIC 43P J 50V
C1204	403 121 9509	CERAMIC 0.1U Z 50V
C1205	403 001 1906	CERAMIC 0.01U M 16V
C1206	403 163 7907	ELECT 47U M 6.3V
C1207	403 121 9509	CERAMIC 0.1U Z 50V
C1208	403 068 8801	CERAMIC 100P J 50V
C1209	403 019 9703	CERAMIC 27P J 50V
C1210	403 222 1105	CERAMIC 0.047U Z 16V
C1211	403 191 8709	ELECT 1U M 50V
C1212	403 004 0213	CERAMIC 0.047U J 25V
C1213	403 191 8709	ELECT 1U M 50V
C1214	403 191 8709	ELECT 1U M 50V
C1215	403 001 1906	CERAMIC 0.01U M 16V

Location	Part No.	Description
C1216	403 003 8616	CERAMIC 0.039U J 25V
C1217	403 001 1906	CERAMIC 0.01U M 16V
C1218	403 001 1906	CERAMIC 0.01U M 16V
C1219	403 001 1906	CERAMIC 0.01U M 16V
C1220	403 121 9509	CERAMIC 0.1U Z 50V
C1221	403 121 9509	CERAMIC 0.1U Z 50V
C1222	403 074 8703	CERAMIC 680P J 50V
C1223	403 072 7500	CERAMIC 330P J 50V
C1224	403 068 8801	CERAMIC 100P J 50V
C1225	403 003 3700	CERAMIC 0.022U Z 25V
C1226	403 121 9509	CERAMIC 0.1U Z 50V
C1227	403 003 3700	CERAMIC 0.022U Z 25V
C1401	403 001 1906	CERAMIC 0.01U M 16V
C1402	403 191 8709	ELECT 1U M 50V
C1403	403 163 7907	ELECT 47U M 6.3V
C1404	403 001 1906	CERAMIC 0.01U M 16V
C1405	403 163 7907	ELECT 47U M 6.3V
C1407	403 191 8709	ELECT 1U M 50V
C1408	403 191 8709	ELECT 1U M 50V
C1409	403 193 7502	ELECT 22U M 6.3V
C1410	403 017 9705	CERAMIC 22P J 50V
C1411	403 071 5408	CERAMIC 220P J 50V
C1412	403 017 9705	CERAMIC 22P J 50V
C1413	403 163 7907	ELECT 47U M 6.3V
C1414	403 121 9509	CERAMIC 0.1U Z 50V
C1451	403 049 0800	ELECT 1U M 50V
C1452	403 001 1906	CERAMIC 0.01U M 16V
C1453	403 038 3409	ELECT 1000U M 6.3V
or	403 135 3302	ELECT 1000U M 6.3V
or	403 038 4505	ELECT 1000U M 6.3V
C1454	403 001 1906	CERAMIC 0.01U M 16V
C1455	403 159 8109	ELECT 100U M 6.3V
C1456	403 003 3700	CERAMIC 0.022U Z 25V
C1460	403 193 7502	ELECT 22U M 6.3V
C1462	403 121 9509	CERAMIC 0.1U Z 50V
C1501	403 163 7907	ELECT 47U M 6.3V
C1502	403 001 1906	CERAMIC 0.01U M 16V
C1507	403 163 7907	ELECT 47U M 6.3V
C1508	403 059 3204	POLYESTER 2200P J 50V
C1509	403 057 0007	POLYESTER 0.01U J 50V
C1510	403 057 2407	POLYESTER 0.1U J 50V
C1511	403 191 8709	ELECT 1U M 50V
C1513	403 163 7907	ELECT 47U M 6.3V
C1514	403 072 4202	CERAMIC 270P J 50V
C1515	403 163 7907	ELECT 47U M 6.3V
C1601	403 191 8709	ELECT 1U M 50V
C1602	403 001 1906	CERAMIC 0.01U M 16V
C1605	403 024 1511	CERAMIC 39P J 50V
C1606	403 024 1511	CERAMIC 39P J 50V
C1608	403 001 1906	CERAMIC 0.01U M 16V
C1610	403 191 8600	ELECT 4.7U M 25V
C1612	403 163 8409	ELECT 47U M 16V
C1650	403 001 1906	CERAMIC 0.01U M 16V
C1651	403 001 1906	CERAMIC 0.01U M 16V
C1653	403 163 8409	ELECT 47U M 16V
C1701	403 163 7907	ELECT 47U M 6.3V
C1702	403 003 3700	CERAMIC 0.022U Z 25V

Location	Part No.	Description
C1703	403 068 8801	CERAMIC 100P J 50V
C1704	403 069 1207	CERAMIC 1000P K 50V
C1705	403 191 8600	ELECT 4.7U M 25V
C1706	403 001 1906	CERAMIC 0.01U M 16V
C1707	403 019 9703	CERAMIC 27P J 50V
C1708	403 001 1906	CERAMIC 0.01U M 16V
C1709	403 009 1809	CERAMIC 10P J 50V
C1710	403 191 8719	ELECT 1U M 50V
C1711	403 001 3801	CERAMIC 1500P K 16V
C1712	403 189 2405	ELECT 10U M 16V
C1713	403 019 9703	CERAMIC 27P J 50V
C1720	403 001 1906	CERAMIC 0.01U M 16V
DL121	613 077 4118	DELAY,2H
D1101	407 012 4406	DIODE 1SS133-T-77
D1102	407 012 4406	DIODE 1SS133-T-77
D1103	407 012 4406	DIODE 1SS133-T-77
D1201	407 012 4406	DIODE 1SS133-T-77
D1203	407 012 4406	DIODE 1SS133-T-77
D1204	407 012 4406	DIODE 1SS133-T-77
D1401	407 012 4406	DIODE 1SS133-T-77
D1403	407 012 4406	DIODE 1SS133-T-77
D1501	407 012 4406	DIODE 1SS133-T-77
D1502	407 012 4406	DIODE 1SS133-T-77
D1503	407 012 4406	DIODE 1SS133-T-77
D1505	407 012 4406	DIODE 1SS133-T-77
D1506	407 012 4406	DIODE 1SS133-T-77
D1507	407 012 4406	DIODE 1SS133-T-77
D1508	407 012 4406	DIODE 1SS133-T-77
D1509	407 012 4406	DIODE 1SS133-T-77
D1510	407 012 4406	DIODE 1SS133-T-77
D1511	407 012 4406	DIODE 1SS133-T-77
D1512	407 012 4406	DIODE 1SS133-T-77
D1513	407 012 4406	DIODE 1SS133-T-77
D1601	407 053 8807	ZENER DIODE MTZ9.1B-T-77
IC111	409 133 8509	IC LA7322
IC121	409 208 7208	IC LA7332
IC141	409 267 5207	IC NJM2266L
IC142	409 267 5207	IC NJM2266L
IC143	409 003 4501	IC BA7021
IC151	409 051 2801	IC TC4052BP
IC152	409 207 2600	IC MLC4081B
IC153	409 018 4206	IC LA6393S
IC154	409 003 9704	IC BU4538B
IC161	409 171 9209	IC LC8992
IC171	409 143 7905	IC CXA1203M-T1
L1201	613 014 1118	COIL,INDUCTOR 18UHJ
L1202	613 014 1132	COIL,INDUCTOR 27UHJ
L1203	613 014 1101	COIL,INDUCTOR 15UHJ
L1204	613 014 0739	COIL,INDUCTOR 1.0UH M
L1401	613 014 1224	COIL,INDUCTOR 150UH J
L1601	613 014 1194	COIL,INDUCTOR 82UHJ
L1701	613 014 1170	COIL,INDUCTOR 56UHJ
L1702	613 014 1187	COIL,INDUCTOR 68UHJ

Location	Part No.	Description
L1703	613 014 1170	COIL,INDUCTOR 56UHJ
Q1001	405 008 4904	TR 2SB764-F-AE
Q1002	405 008 4904	TR 2SB764-F-AE
Q1201	405 019 2005	TR 2SC536-E-SPA-AC
Q1202	405 057 6409	TR 2SC4038-R-TL2
Q1203	405 004 4007	TR 2SA608-E-SPA-AC
Q1204	405 019 2005	TR 2SC536-E-SPA-AC
Q1205	405 019 2005	TR 2SC536-E-SPA-AC
Q1206	405 064 0209	TR 2SA1561-TL2-R
Q1401	405 019 2005	TR 2SC536-E-SPA-AC
Q1404	405 019 2005	TR 2SC536-E-SPA-AC
Q1405	405 019 2005	TR 2SC536-E-SPA-AC
Q1406	405 019 2005	TR 2SC536-E-SPA-AC
Q1451	405 019 2005	TR 2SC536-E-SPA-AC
Q1501	405 057 6409	TR 2SC4038-R-TL2
Q1601	405 004 4017	TR 2SA608-E-SPA-AC
Q1602	405 019 2005	TR 2SC536-E-SPA-AC
Q1701	405 019 2005	TR 2SC536-E-SPA-AC
Q1702	405 019 2005	TR 2SC536-E-SPA-AC
Q1703	405 004 4007	TR 2SA608-E-SPA-AC
Q1704	405 019 2005	TR 2SC536-E-SPA-AC
Q1705	405 019 2005	TR 2SC536-E-SPA-AC
R1001	401 012 6903	CARBON 10K JA 1/4W
R1002	401 021 8905	CARBON 6.2K JA 1/4W
R1003	401 018 3708	CARBON 3.3K JA 1/4W
R1004	401 012 5609	CARBON 1K JA 1/4W
R1101	401 013 5202	CARBON 1.2K JA 1/4W
R1102	401 018 4804	CARBON 33K JA 1/4W
R1104	401 018 5702	CARBON 330K JA 1/4W
R1105	401 018 5702	CARBON 330K JA 1/4W
R1106	401 012 6903	CARBON 10K JA 1/4W
R1107	401 014 5102	CARBON 15K JA 1/4W
R1108	401 018 4804	CARBON 33K JA 1/4W
R1109	401 015 9406	CARBON 2K JA 1/4W
R1110	401 020 8302	CARBON 5.1K JA 1/4W
R1111	401 017 1705	CARBON 2.7K JA 1/4W
R1112	401 020 7800	CARBON 510 JA 1/4W
R1113	401 016 3700	CARBON 2.2K JA 1/4W
R1115	401 020 9200	CARBON 510K JA 1/4W
R1116	401 012 9201	CARBON 1M JA 1/4W
R1117	401 012 9201	CARBON 1M JA 1/4W
R1118	401 021 2903	CARBON 5.6K JA 1/4W
R1119	401 019 2948	CARBON 39K JA 1/4W
R1201	401 023 2703	CARBON 8.2K JA 1/4W
R1202	401 016 4707	CARBON 22K JA 1/4W
R1203	401 015 2605	CARBON 1.8K JA 1/4W
R1204	401 016 3700	CARBON 2.2K JA 1/4W
R1205	401 012 8006	CARBON 100K JA 1/4W
R1206	401 012 5609	CARBON 1K JA 1/4W
R1207	401 012 5609	CARBON 1K JA 1/4W
R1208	401 013 5202	CARBON 1.2K JA 1/4W
R1210	401 012 5609	CARBON 1K JA 1/4W
R1211	401 016 4707	CARBON 22K JA 1/4W
R1212	401 012 5609	CARBON 1K JA 1/4W
R1213	401 012 5609	CARBON 1K JA 1/4W

Location	Part No.	Description
R1214	401 012 6903	CARBON 10K JA 1/4W
R1216	401 020 0702	CARBON 470 JA 1/4W
R1217	401 014 4006	CARBON 1.5K JA 1/4W
R1218	401 014 9001	CARBON 16K JA 1/4W
R1219	401 019 2908	CARBON 39K JA 1/4W
R1220	401 013 9408	CARBON 1.3K JA 1/4W
R1221	401 022 7105	CARBON 750 JA 1/4W
R1222	401 012 5609	CARBON 1K JA 1/4W
R1223	401 022 0740	CARBON 68 JA 1/4W
R1224	401 012 5609	CARBON 1K JA 1/4W
R1225	401 012 5609	CARBON 1K JA 1/4W
R1227	401 016 5704	CARBON 220K JA 1/4W
R1228	401 012 5609	CARBON 1K JA 1/4W
R1401	401 012 5609	CARBON 1K JA 1/4W
R1402	401 020 1907	CARBON 4.7K JA 1/4W
R1404	401 012 5609	CARBON 1K JA 1/4W
R1405	401 012 6903	CARBON 10K JA 1/4W
R1406	401 012 6903	CARBON 10K JA 1/4W
R1407	401 012 6903	CARBON 10K JA 1/4W
R1408	401 014 5102	CARBON 15K JA 1/4W
R1409	401 012 5609	CARBON 1K JA 1/4W
R1410	401 012 5609	CARBON 1K JA 1/4W
R1411	401 012 5609	CARBON 1K JA 1/4W
R1412	401 012 5609	CARBON 1K JA 1/4W
R1415	401 020 2805	CARBON 47K JA 1/4W
R1419	401 022 4005	CARBON 68K JA 1/4W
R1420	401 017 2702	CARBON 27K JA 1/4W
R1421	401 019 1802	CARBON 3.9K JA 1/4W
R1422	401 016 3700	CARBON 2.2K JA 1/4W
R1423	401 013 9428	CARBON 1.3K JA 1/4W
R1424	401 012 5609	CARBON 1K JA 1/4W
R1425	401 012 4404	CARBON 100 JA 1/4W
R1426	401 013 5202	CARBON 1.2K JA 1/4W
R1427	401 012 5609	CARBON 1K JA 1/4W
R1428	401 013 9408	CARBON 1.3K JA 1/4W
R1429	401 012 6903	CARBON 10K JA 1/4W
R1430	401 012 6903	CARBON 10K JA 1/4W
R1432	401 012 5609	CARBON 1K JA 1/4W
R1450	401 012 6903	CARBON 10K JA 1/4W
R1451	401 012 5609	CARBON 1K JA 1/4W
R1452	401 012 5609	CARBON 1K JA 1/4W
R1453	401 012 6903	CARBON 10K JA 1/4W
R1454	401 012 6903	CARBON 10K JA 1/4W
R1455	401 012 6903	CARBON 10K JA 1/4W
R1456	401 018 9700	CARBON 39 JA 1/4W
R1457	401 012 6903	CARBON 10K JA 1/4W
R1458	401 014 5102	CARBON 15K JA 1/4W
R1460	401 022 0700	CARBON 68 JA 1/4W
R1501	401 012 8006	CARBON 100K JA 1/4W
R1502	401 012 8006	CARBON 100K JA 1/4W
R1503	401 020 1907	CARBON 4.7K JA 1/4W
R1504	401 012 5609	CARBON 1K JA 1/4W
R1505	401 012 8006	CARBON 100K JA 1/4W
R1506	401 012 5609	CARBON 1K JA 1/4W
R1507	401 012 8006	CARBON 100K JA 1/4W
R1508	401 020 1907	CARBON 4.7K JA 1/4W
R1509	401 020 1907	CARBON 4.7K JA 1/4W

Location	Part No.	Description
R1510	401 020 2805	CARBON 47K JA 1/4W
R1511	401 012 5609	CARBON 1K JA 1/4W
R1512	401 016 4707	CARBON 22K JA 1/4W
R1513	401 018 4804	CARBON 33K JA 1/4W
R1514	401 022 4005	CARBON 68K JA 1/4W
R1515	401 012 5609	CARBON 1K JA 1/4W
R1516	401 012 6903	CARBON 10K JA 1/4W
R1517	401 023 4509	CARBON 820K JA 1/4W
R1518	401 012 9201	CARBON 1M JA 1/4W
R1519	401 012 5609	CARBON 1K JA 1/4W
R1520	401 012 6903	CARBON 10K JA 1/4W
R1521	401 012 6903	CARBON 10K JA 1/4W
R1522	401 018 3708	CARBON 3.3K JA 1/4W
R1523	401 012 6903	CARBON 10K JA 1/4W
R1524	401 012 6903	CARBON 10K JA 1/4W
R1525	401 018 5702	CARBON 330K JA 1/4W
R1526	401 012 6903	CARBON 10K JA 1/4W
R1527	401 020 1907	CARBON 4.7K JA 1/4W
R1528	401 012 6903	CARBON 10K JA 1/4W
R1529	401 012 6903	CARBON 10K JA 1/4W
R1530	401 022 8003	CARBON 75K JA 1/4W
R1531	401 020 1907	CARBON 4.7K JA 1/4W
R1532	401 012 6903	CARBON 10K JA 1/4W
R1603	401 012 5609	CARBON 1K JA 1/4W
R1604	401 012 5609	CARBON 1K JA 1/4W
R1650	401 012 4404	CARBON 100 JA 1/4W
R1651	401 012 9201	CARBON 1M JA 1/4W
R1652	401 023 1657	CARBON 820 JA 1/4W
R1701	401 012 5609	CARBON 1K JA 1/4W
R1702	401 020 4601	CARBON 4.7M JA 1/4W
R1703	401 020 1907	CARBON 4.7K JA 1/4W
R1704	401 012 5609	CARBON 1K JA 1/4W
R1705	401 012 5609	CARBON 1K JA 1/4W
R1706	401 016 4707	CARBON 22K JA 1/4W
R1707	401 019 2908	CARBON 39K JA 1/4W
R1708	401 012 5609	CARBON 1K JA 1/4W
R1709	401 012 6903	CARBON 10K JA 1/4W
R1710	401 012 6903	CARBON 10K JA 1/4W
R1711	401 012 5609	CARBON 1K JA 1/4W
R1712	401 012 5609	CARBON 1K JA 1/4W
R1713	401 013 5202	CARBON 1.2K JA 1/4W
R1714	401 016 3700	CARBON 2.2K JA 1/4W
R1716	401 016 0006	CARBON 20K JA 1/4W
R1717	401 012 6903	CARBON 10K JA 1/4W
R1718	401 012 6903	CARBON 10K JA 1/4W
R1719	401 012 8006	CARBON 100K JA 1/4W
R1720	401 012 8006	CARBON 100K JA 1/4W
R1721	401 022 1806	CARBON 680 JA 1/4W
R1722	401 018 3708	CARBON 3.3K JA 1/4W
R1723	401 014 4006	CARBON 1.5K JA 1/4W
R1724	401 012 5609	CARBON 1K JA 1/4W
R1725	401 016 3700	CARBON 2.2K JA 1/4W
R1726	401 013 5202	CARBON 1.2K JA 1/4W
R1727	401 012 4404	CARBON 100 JA 1/4W
R1730	401 018 3708	CARBON 3.3K JA 1/4W
VR111	613 001 9417	SEMI VR 10KB

Location	Part No.	Description
or	613 079 2532	VR,SEMI 10KB
VR112	613 001 9424	SEMI VR 20KB
or	613 079 2549	VR,SEMI 20KB
VR113	613 001 9417	SEMI VR 10KB
or	613 079 2532	VR,SEMI 10KB
VR141	613 001 9394	SEMI VR 3KB
or	613 112 4882	VR,SEMI 3KB
VR161	613 001 9370	SEMI VR 1KB
or	613 079 2525	VR,SEMI 1KB
VR171	613 001 9400	SEMI VR
or	613 112 4912	VR,SEMI 5KB
VR172	613 001 9424	SEMI VR 20KB
or	613 079 2549	VR,SEMI 20KB
XF121	613 004 5485	LC PACK
XF141	613 004 5539	LC PACK 4MHZ LPF
XF142	613 091 1094	FILTER,4MHZ L.P
X1201	613 080 9407	OSC,CRYSTAL 4.43MHZ
	613 135 6917	COMPL PCB,TM-A
	613 091 1087	CADNICA
BZ701	420 000 0204	PZ•BZR PKM17EPP-4001
B7201	405 063 9708	TR DTC144EL-TL2
B7501	405 063 9708	TR DTC144EL-TL2
B7502	405 063 9708	TR DTC144EL-TL2
CT741	613 002 6330	TRIMMER
C7201	403 135 3500	ELECT 220U M 6.3V
C7202	403 121 9509	CERAMIC 0.1U Z 50V
C7208	403 001 1906	CERAMIC 0.01U M 16V
C7209	403 001 1906	CERAMIC 0.01U M 16V
C7210	403 001 1906	CERAMIC 0.01U M 16V
C7211	403 001 1906	CERAMIC 0.01U M 16V
C7212	403 191 8808	ELECT 2.2U M 50V
C7301	403 001 1906	CERAMIC 0.01U M 16V
C7302	403 150 6500	ELECT 22U M 16V
C7401	403 001 1906	CERAMIC 0.01U M 16V
C7402	403 163 7907	ELECT 47U M 6.3V
C7403	403 001 1906	CERAMIC 0.01U M 16V
C7405	403 068 8801	CERAMIC 100P J 50V
C7406	403 001 1906	CERAMIC 0.01U M 16V
C7407	403 191 8709	ELECT 1U M 50V
C7411	403 068 8801	CERAMIC 100P J 50V
C7412	403 068 8801	CERAMIC 100P J 50V
C7502	403 135 3302	ELECT 1000U M 6.3V
or	403 038 4505	ELECT 1000U M 6.3V
C7503	403 135 3500	ELECT 220U M 6.3V
C7504	403 150 6500	ELECT 22U M 16V
C7505	403 189 2405	ELECT 10U M 16V
C7506	403 150 6500	ELECT 22U M 16V
C7802	403 058 7807	POLYESTER 1800P J 50V
C7803	403 058 7807	POLYESTER 1800P J 50V
C7804	403 121 9509	CERAMIC 0.1U Z 50V

Location	Part No.	Description
D7201	407 012 4406	DIODE 1SS133-T-77
D7301	407 012 4406	DIODE 1SS133-T-77
D7302	407 012 4406	DIODE 1SS133-T-77
D7303	407 012 4406	DIODE 1SS133-T-77
D7304	407 012 4406	DIODE 1SS133-T-77
D7305	407 012 4406	DIODE 1SS133-T-77
D7306	407 012 4406	DIODE 1SS133-T-77
D7307	407 012 4406	DIODE 1SS133-T-77
D7308	407 012 4406	DIODE 1SS133-T-77
D7309	407 012 4406	DIODE 1SS133-T-77
D7310	407 012 4406	DIODE 1SS133-T-77
D7311	407 012 4406	DIODE 1SS133-T-77
D7312	407 012 4406	DIODE 1SS133-T-77
D7313	407 012 4406	DIODE 1SS133-T-77
D7314	407 012 4406	DIODE 1SS133-T-77
D7315	407 012 4406	DIODE 1SS133-T-77
D7316	407 012 4406	DIODE 1SS133-T-77
D7317	407 012 4406	DIODE 1SS133-T-77
D7318	407 012 4406	DIODE 1SS133-T-77
D7319	407 012 4406	DIODE 1SS133-T-77
D7320	407 012 4406	DIODE 1SS133-T-77
D7321	407 012 4406	DIODE 1SS133-T-77
D7322	407 012 4406	DIODE 1SS133-T-77
D7501	407 078 2705	DIODE 1SS244-T-77
D7502	407 078 2705	DIODE 1SS244-T-77
IC731	409 020 3204	IC LB1475
IC741	409 238 3300	IC M50556-001SP
IC781	409 050 8200	IC TC4011 BF
L7401	613 014 0739	COIL,INDUCTOR 1.0UHM
L7403	613 014 1101	COIL,INDUCTOR 15UHJ
Q7201	405 057 6409	TR 2SC4038-R-TL2
Q7202	405 064 0209	TR 2SA1561-TL2-R
Q7203	405 064 0209	TR 2SA1561-TL2-R
Q7204	405 057 6409	TR 2SC4038-R-TL2
Q7205	405 057 6409	TR 2SC4038-R-TL2
Q7206	405 064 0209	TR 2SA1561-TL2-R
Q7207	405 057 6409	TR 2SC4038-R-TL2
Q7208	405 064 0209	TR 2SA1561-TL2-R
Q7209	405 057 6409	TR 2SC4038-R-TL2
Q7501	405 004 4007	TR 2SA608-E-SPA-AC
Q7502	405 057 6409	TR 2SC4038-R-TL2
Q7503	405 057 6409	TR 2SC4038-R-TL2
RB751	613 079 5878	R-NETWORK,10KX4
R7201	401 020 1907	CARBON 4.7K JA 1/4W
R7202	401 012 6903	CARBON 10K JA 1/4W
R7203	401 012 6903	CARBON 10K JA 1/4W
R7204	401 012 6903	CARBON 10K JA 1/4W
R7205	401 012 6903	CARBON 10K JA 1/4W
R7206	401 012 6903	CARBON 10K JA 1/4W
R7207	401 012 5609	CARBON 1K JA 1/4W
R7208	401 012 5609	CARBON 1K JA 1/4W
R7209	401 012 6903	CARBON 10K JA 1/4W

Location	Part No.	Description
R7210	401 012 6903	CARBON 10K JA 1/4W
R7211	401 012 5609	CARBON 1K JA 1/4W
R7212	401 012 5609	CARBON 1K JA 1/4W
R7213	401 012 6903	CARBON 10K JA 1/4W
R7214	401 012 5609	CARBON 1K JA 1/4W
R7215	401 012 6903	CARBON 10K JA 1/4W
R7216	401 012 6903	CARBON 10K JA 1/4W
R7217	401 020 1907	CARBON 4.7K JA 1/4W
R7218	401 012 5609	CARBON 1K JA 1/4W
R7219	401 012 6903	CARBON 10K JA 1/4W
R7220	401 012 6903	CARBON 10K JA 1/4W
R7221	401 012 6903	CARBON 10K JA 1/4W
R7222	401 012 6903	CARBON 10K JA 1/4W
R7223	401 012 5609	CARBON 1K JA 1/4W
R7224	401 012 5609	CARBON 1K JA 1/4W
R7225	401 020 1907	CARBON 4.7K JA 1/4W
R7226	401 012 5609	CARBON 1K JA 1/4W
R7227	401 012 6903	CARBON 10K JA 1/4W
R7229	401 012 6903	CARBON 10K JA 1/4W
R7230	401 012 6903	CARBON 10K JA 1/4W
R7231	401 012 6903	CARBON 10K JA 1/4W
R7232	401 012 5609	CARBON 1K JA 1/4W
R7233	401 012 5609	CARBON 1K JA 1/4W
R7234	401 012 5609	CARBON 1K JA 1/4W
R7235	401 012 6903	CARBON 10K JA 1/4W
R7236	401 012 6903	CARBON 10K JA 1/4W
R7237	401 012 6903	CARBON 10K JA 1/4W
R7238	401 012 6903	CARBON 10K JA 1/4W
R7301	401 020 1907	CARBON 4.7K JA 1/4W
R7302	401 012 5609	CARBON 1K JA 1/4W
R7303	401 012 6903	CARBON 10K JA 1/4W
R7304	401 014 0206	CARBON 130K JA 1/4W
R7305	401 023 7807	CARBON 91K JA 1/4W
R7306	401 012 6903	CARBON 10K JA 1/4W
R7307	401 014 0206	CARBON 130K JA 1/4W
R7308	401 023 7807	CARBON 91K JA 1/4W
R7309	401 012 6903	CARBON 10K JA 1/4W
R7310	401 014 0206	CARBON 130K JA 1/4W
R7311	401 023 7807	CARBON 91K JA 1/4W
R7312	401 012 6903	CARBON 10K JA 1/4W
R7313	401 014 0206	CARBON 130K JA 1/4W
R7314	401 023 7807	CARBON 91K JA 1/4W
R7315	401 012 5609	CARBON 1K JA 1/4W
R7316	401 012 5609	CARBON 1K JA 1/4W
R7317	401 012 5609	CARBON 1K JA 1/4W
R7318	401 012 5609	CARBON 1K JA 1/4W
R7401	401 012 6903	CARBON 10K JA 1/4W
R7402	401 012 6903	CARBON 10K JA 1/4W
R7403	401 012 6903	CARBON 10K JA 1/4W
R7404	401 012 6903	CARBON 10K JA 1/4W
R7405	401 012 6903	CARBON 10K JA 1/4W
R7406	401 012 5609	CARBON 1K JA 1/4W
R7407	401 012 5609	CARBON 1K JA 1/4W
R7408	401 012 5609	CARBON 1K JA 1/4W
R7502	401 017 0708	CARBON 270 JA 1/4W
R7503	401 017 8506	CARBON 300 JA 1/4W
R7504	401 012 6903	CARBON 10K JA 1/4W

Location	Part No.	Description
R7505	401 012 6903	CARBON 10K JA 1/4W
R7506	401 016 5704	CARBON 220K JA 1/4W
R7507	401 012 8006	CARBON 100K JA 1/4W
R7508	401 020 2805	CARBON 47K JA 1/4W
R7509	401 012 6903	CARBON 10K JA 1/4W
R7510	401 012 5609	CARBON 1K JA 1/4W
R7511	401 012 6903	CARBON 10K JA 1/4W
R7512	401 012 8006	CARBON 100K JA 1/4W
R7513	401 016 5704	CARBON 220K JA 1/4W
R7516	401 012 8006	CARBON 100K JA 1/4W
R7520	401 012 6903	CARBON 10K JA 1/4W
R7801	401 012 6903	CARBON 10K JA 1/4W
R7802	401 014 6000	CARBON 150K JA 1/4W
R7803	401 014 6000	CARBON 150K JA 1/4W
R7804	401 012 8006	CARBON 100K JA 1/4W
S7502	613 006 2192	SLIDE SWITCH

TM-1 BOARD

Location	Part No.	Description
	613 132 1106	COMPL PCB,TM-1
A7001	613 115 9792	FLUORESCENT TUBE
CN701	613 009 8368	SOCKET
CN702	613 108 7453	SOCKET,14P
CN703	613 009 1826	SOCKET 3P
C7001	403 121 9509	CERAMIC 0.1U Z 50V
C7002	403 121 9509	CERAMIC 0.1U Z 50V
C7003	403 017 0108	CERAMIC 20P J 50V
C7004	403 017 0108	CERAMIC 20P J 50V
C7005	403 001 1906	CERAMIC 0.01U M 16V
C7006	403 139 0802	ELECT 22U M 6.3V
C7007	403 121 9509	CERAMIC 0.1U Z 50V
C7008	403 139 1007	ELECT 47U M 6.3V
D7001	407 012 4406	DIODE 1SS133-T-77
D7002	407 012 4406	DIODE 1SS133-T-77
D7003	407 012 4406	DIODE 1SS133-T-77
D7004	407 012 4406	DIODE 1SS133-T-77
D7006	407 012 4406	DIODE 1SS133-T-77
D7007	407 012 4406	DIODE 1SS133-T-77
D7008	407 012 4406	DIODE 1SS133-T-77
D7009	407 012 4406	DIODE 1SS133-T-77
D7010	407 012 4406	DIODE 1SS133-T-77
D7014	407 012 4406	DIODE 1SS133-T-77
IC701	410 153 8400	IC M38102E5-223SP
IC702	409 243 4101	IC MN1380-L
IC703	409 148 5005	IC M6M80021P
RB701	613 079 5878	R-NETWORK,10KX4
R7001	401 012 5609	CARBON 1K JA 1/4W
R7002	401 012 9201	CARBON 1M JA 1/4W
R7003	401 110 6201	CARBON 10M JA 1/4W
R7004	401 018 5702	CARBON 330K JA 1/4W
R7005	401 022 1806	CARBON 680 JA 1/4W
R7006	401 012 5609	CARBON 1K JA 1/4W
R7007	401 012 5609	CARBON 1K JA 1/4W
R7008	401 012 5609	CARBON 1K JA 1/4W
R7009	401 012 5609	CARBON 1K JA 1/4W
R7010	401 012 6903	CARBON 10K JA 1/4W
R7011	401 012 6903	CARBON 10K JA 1/4W
R7012	401 012 6903	CARBON 10K JA 1/4W
S7001	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7002	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7003	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7004	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7005	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH

Location	Part No.	Description
S7006	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7007	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7008	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7009	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7010	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7011	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7012	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7013	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7014	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7015	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7016	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7017	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
XF701	613 109 0972	OSC,CRYSTAL 32KHZ
XF702	613 089 4069	RESONATOR,CERAMIC 6MHZ
or	613 122 1444	RESONATOR,CERAMIC 6.0MHZ
or	613 124 2135	RESONATOR,CERAMIC 6MHZ

TM-2 BOARD

Location	Part No.	Description
	613 132 1113	**COMPL PCB,TM-2**
B7101	405 018 2501	TR 2SC3399-AC
C7101	403 139 1106	ELECT 10U M 10V
D7101	407 012 4406	DIODE 1SS133-T-77
D7102	407 012 4406	DIODE 1SS133-T-77
D7103	407 012 4406	DIODE 1SS133-T-77
D7104	407 012 4406	DIODE 1SS133-T-77
D7105	407 131 1102	LED EBR 3668S
D7106	407 131 1102	LED EBR 3668S
D7108	407 012 4406	DIODE 1SS133-T-77
D7109	407 012 4406	DIODE 1SS133-T-77
D7110	407 012 4406	DIODE 1SS133-T-77
R7101	401 012 5609	CARBON 1K JA 1/4W
R7102	401 019 0904	CARBON 390 JA 1/4W
R7103	401 019 0904	CARBON 390 JA 1/4W
S7101	613 081 0939	SLIDE SWITCH 2-3
S7102	613 081 0939	SLIDE SWITCH 2-3
S7103	613 081 0939	SLIDE SWITCH 2-3
S7104	613 081 0939	SLIDE SWITCH 2-3
S7105	613 081 0939	SLIDE SWITCH 2-3
S7107	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7108	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
S7109	613 077 4354	PUSH SWITCH
or	613 092 0744	SW,PUSH
VR711	613 132 0970	VR,ROTARY 100K B
VR712	613 132 0970	VR,ROTARY 100K B
VR713	613 132 0963	VR,ROTARY 20K B

TB-1 BOARD

Location	Part No.	Description			
	613 138 9458	COMPL PCB,TB-1			
C2201	403 139 1809	ELECT	47U	M	16V
C2202	403 139 1809	ELECT	47U	M	16V
C2203	403 012 6006	CERAMIC	15P	J	50V
C2204	403 139 1809	ELECT	47U	M	16V
C2205	403 139 1809	ELECT	47U	M	16V
C2206	403 139 1809	ELECT	47U	M	16V
C2207	403 069 0309	CERAMIC	1000P	J	50V
C2208	403 069 0309	CERAMIC	1000P	J	50V
C2209	403 139 1809	ELECT	47U	M	16V
C2210	403 069 1207	CERAMIC	1000P	K	50V
C2214	403 069 1207	CERAMIC	1000P	K	50V
D2201	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2202	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2203	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2204	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2205	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2206	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2207	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2208	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2209	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2210	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2211	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2212	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2213	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2214	407 063 7906	ZENER DIODE MTZ13C-T-77			
D2215	407 063 7906	ZENER DIODE MTZ13C-T-77			
D7224	407 063 7906	ZENER DIODE MTZ13C-T-77			
IC221	409 039 7903	IC NJM4558S			
JK221	613 087 2791	JACK,MIC			
JK222	613 009 1529	SOCKET			
JK223	613 009 1529	SOCKET			
JK224	613 091 4071	JACK,HEADPHONE			
JK225	613 133 8418	CONNECTOR,BNC			
JK226	613 133 8418	CONNECTOR,BNC			
R2201	401 012 5609	CARBON	1K	JA	1/4W
R2202	401 017 3709	CARBON	270K	JA	1/4W
R2203	401 016 5704	CARBON	220K	JA	1/4W
R2204	401 012 6903	CARBON	10K	JA	1/4W
R2205	401 012 6903	CARBON	10K	JA	1/4W
R2206	401 013 7206	CARBON	120K	JA	1/4W
R2207	401 016 4707	CARBON	22K	JA	1/4W
R2208	401 012 5609	CARBON	1K	JA	1/4W
R2209	401 012 6903	CARBON	10K	JA	1/4W
R2210	401 002 6702	CARBON	75	JA	1/4W
VR221	613 132 0987	VR,ROTARY 100K B			
VR222	613 112 4820	VR,SEMI 100KB			

VP-1 BOARD

Location	Part No.	Description			
	613 132 1137	COMPL PCB,VP-1			
B1801	405 018 2501	TR 2SC3399-AC			
B1802	405 018 2501	TR 2SC3399-AC			
B1804	405 018 2501	TR 2SC3399-AC			
B1805	405 018 2501	TR 2SC3399-AC			
C1801	403 003 2802	CERAMIC	0.022U	K	25V
C1802	403 121 9509	CERAMIC	0.1U	Z	50V
C1803	403 121 9509	CERAMIC	0.1U	Z	50V
C1804	403 003 2802	CERAMIC	0.022U	K	25V
C1805	403 003 2802	CERAMIC	0.022U	K	25V
C1806	403 121 9509	CERAMIC	0.1U	Z	50V
C1807	403 121 9509	CERAMIC	0.1U	Z	50V
C1808	403 003 2802	CERAMIC	0.022U	K	25V
C1809	403 069 0309	CERAMIC	1000P	J	50V
C1810	403 003 3700	CERAMIC	0.022U	Z	25V
C1811	403 069 0309	CERAMIC	1000P	J	50V
C1812	403 068 8801	CERAMIC	100P	J	50V
C1813	403 003 2802	CERAMIC	0.022U	K	25V
C1814	403 139 2707	ELECT	1U	M	50V
C1815	403 003 3700	CERAMIC	0.022U	Z	25V
C1816	403 139 0703	ELECT	100U	M	6.3V
C1817	403 003 3700	CERAMIC	0.022U	Z	25V
C1818	403 014 2600	CERAMIC	18P	J	50V
C1819	403 026 2209	CERAMIC	47P	J	50V
C1820	403 003 2802	CERAMIC	0.022U	K	25V
C1821	403 017 9705	CERAMIC	22P	J	50V
C1822	403 022 7713	CERAMIC	33P	J	50V
C1823	403 070 3702	CERAMIC	120P	J	50V
C1824	403 022 7703	CERAMIC	33P	J	50V
C1825	403 003 3700	CERAMIC	0.022U	Z	25V
C1826	403 071 1519	CERAMIC	180P	J	50V
C1827	403 070 7215	CERAMIC	150P	J	50V
C1828	403 003 2802	CERAMIC	0.022U	K	25V
C1829	403 001 1906	CERAMIC	0.01U	M	16V
C1830	403 073 2702	CERAMIC	390P	J	50V
C1831	403 072 7500	CERAMIC	330P	J	50V
C1832	403 001 1906	CERAMIC	0.01U	M	16V
C1833	403 193 7809	ELECT	100U	M	16V
C1834	403 121 9509	CERAMIC	0.1U	Z	50V
C1835	403 121 9509	CERAMIC	0.1U	Z	50V
C1836	403 121 9509	CERAMIC	0.1U	Z	50V
C1837	403 139 1007	ELECT	47U	M	6.3V
C1838	403 003 3700	CERAMIC	0.022U	Z	25V
C1839	403 003 3700	CERAMIC	0.022U	Z	25V
C1840	403 003 3700	CERAMIC	0.022U	Z	25V
D1801	407 053 8906	ZENER DIODE MTZ9.1C-T-77			
D1802	407 012 4406	DIODE 1SS133-T-77			
IC181	409 278 8204	IC AN3383K			
L1801	613 015 6730	COIL,INDUCTOR 100UH K			
L1802	613 014 1163	COIL,INDUCTOR 47UH J			
L1804	613 014 1163	COIL,INDUCTOR 47UH J			
L1807	613 015 6822	COIL,INDUCTOR 560UH K			

Location	Part No.	Description
L1808	613 014 1088	COIL,INDUCTOR 10UHJ
L1809	613 014 1149	COIL,INDUCTOR 33UHJ
L1810	613 015 6792	COIL,INDUCTOR 330UHK
L1811	613 014 1224	COIL,INDUCTOR 150UHJ
L1812	613 014 1248	COIL,INDUCTOR 220UHJ
L1813	613 014 1217	COIL,INDUCTOR 120UHJ
Q1802	405 016 0905	TR 2SC2839-E-SPA-AC
Q1803	405 004 4007	TR 2SA608-E-SPA-AC
Q1804	405 016 0905	TR 2SC2839-E-SPA-AC
Q1806	405 016 0905	TR 2SC2839-E-SPA-AC
Q1807	405 019 2005	TR 2SC536-E-SPA-AC
Q1809	405 019 2005	TR 2SC536-E-SPA-AC
Q1810	405 019 2005	TR 2SC536-E-SPA-AC
Q1811	405 004 4007	TR 2SA608-E-SPA-AC
Q1812	405 004 4007	TR 2SA608-E-SPA-AC
Q1813	405 004 4007	TR 2SA608-E-SPA-AC
R1801	401 014 8202	CARBON 160 JA 1/4W
R1802	401 014 8202	CARBON 160 JA 1/4W
R1803	401 015 8805	CARBON 200 JA 1/4W
R1804	401 015 8805	CARBON 200 JA 1/4W
R1805	401 015 9406	CARBON 2K JA 1/4W
R1806	401 012 4404	CARBON 100 JA 1/4W
R1807	401 012 6903	CARBON 10K JA 1/4W
R1808	401 016 7906	CARBON 2.4K JA 1/4W
R1809	401 012 6903	CARBON 10K JA 1/4W
R1810	401 014 5102	CARBON 15K JA 1/4W
R1811	401 017 9206	CARBON 3K JA 1/4W
R1812	401 017 8506	CARBON 300 JA 1/4W
R1813	401 012 4404	CARBON 100 JA 1/4W
R1814	401 012 4404	CARBON 100 JA 1/4W
R1815	401 013 5202	CARBON 1.2K JA 1/4W
R1818	401 012 5609	CARBON 1K JA 1/4W
R1819	401 012 5609	CARBON 1K JA 1/4W
R1820	401 012 5609	CARBON 1K JA 1/4W
R1821	401 017 1755	CARBON 2.7K JA 1/4W
R1822	401 016 3700	CARBON 2.2K JA 1/4W
R1823	401 015 2645	CARBON 1.8K JA 1/4W
R1824	401 012 5609	CARBON 1K JA 1/4W
R1825	401 012 5609	CARBON 1K JA 1/4W
R1830	401 012 6903	CARBON 10K JA 1/4W
R1831	401 012 6903	CARBON 10K JA 1/4W
R1832	401 016 3700	CARBON 2.2K JA 1/4W
R1833	401 012 4404	CARBON 100 JA 1/4W
R1834	401 012 6903	CARBON 10K JA 1/4W
R1835	401 012 5609	CARBON 1K JA 1/4W
R1836	401 012 5609	CARBON 1K JA 1/4W
R1837	401 018 2701	CARBON 330 JA 1/4W
R1838	401 012 5609	CARBON 1K JA 1/4W
R1839	401 012 5609	CARBON 1K JA 1/4W
R1840	401 012 4404	CARBON 100 JA 1/4W
R1841	401 012 6903	CARBON 10K JA 1/4W
R1842	401 012 6903	CARBON 10K JA 1/4W
R1843	401 016 3700	CARBON 2.2K JA 1/4W
R1844	401 016 3700	CARBON 2.2K JA 1/4W
R1846	401 014 4006	CARBON 1.5K JA 1/4W

Location	Part No.	Description
R1847	401 018 3708	CARBON 3.3K JA 1/4W
R1848	401 012 5609	CARBON 1K JA 1/4W
R1849	401 018 3708	CARBON 3.3K JA 1/4W
R1850	401 012 5609	CARBON 1K JA 1/4W
R1851	401 012 5609	CARBON 1K JA 1/4W
R1852	401 012 5609	CARBON 1K JA 1/4W
R1853	401 012 5609	CARBON 1K JA 1/4W
R1854	401 022 0700	CARBON 68 JA 1/4W
R1855	401 022 0700	CARBON 68 JA 1/4W
R1856	401 021 1807	CARBON 560 JA 1/4W
VR181	613 117 1701	SEMI VR 220B
VR182	613 138 1247	SEMI VR 100B

PW-1 BOARD

Location	Part No.	Description
	613 132 3322	COMPL PCB,PW-1
C5001	404 044 7900	MT-POLYEST 0.22U M 250V
C5002	404 044 7009	MT-POLYEST 0.068U M 250V
C5003	404 052 4304	ELECT 62U M 400V
C5004	404 183 3309	MT-POLYEST 0.047U M 630V
C5005	403 137 5007	CERAMIC 100P K 1K
or	403 137 5017	CERAMIC 100P K 1K
C5007	403 222 1808	ELECT 1U M 400V
C5008	403 094 0800	OS-SOLID 2.2U M 16V
C5009	403 061 7702	POLYESTER 4700P J 50V
C5010	403 018 6208	CERAMIC 220P J 50V
or	403 214 9706	CERAMIC 220P J 50V
C5011	403 001 5003	CERAMIC 2200P K 16V
C5012	403 058 9504	POLYESTER 0.018U J 50V
C5013	403 058 9504	POLYESTER 0.018U J 50V
C5020	404 034 7507	CERAMIC 2200P M 400V
or	404 032 6304	CERAMIC 2200P M 400V
C5021	404 034 7507	CERAMIC 2200P M 400V
or	404 032 6304	CERAMIC 2200P M 400V
C5022	404 034 7507	CERAMIC 2200P M 400V
or	404 032 6304	CERAMIC 2200P M 400V
C5023	404 034 7507	CERAMIC 2200P M 400V
or	404 032 6304	CERAMIC 2200P M 400V
C5101	403 205 2105	ELECT 1200U M 16V
C5102	403 160 7207	ELECT 470U M 16V
C5104	403 205 2105	ELECT 1200U M 16V
C5105	403 147 9507	ELECT 470U M 6.3V
or	403,160 2905	ELECT 470U M 6.3V
C5106	403 121 6607	ELECT 47U M 50V
or	403 154 8302	ELECT 47U M 50V
C5107	403 121 6607	ELECT 47U M 50V
or	403 154 8302	ELECT 47U M 50V
C5108	403 160 2400	ELECT 330U M 6.3V
or	403 155 5508	ELECT 330U M 6.3V
C5109	403 004 0500	CERAMIC 0.047U K 25V
C5110	403 168 6103	MT-POLYEST 0.1U J 50V
C5111	403 125 5606	ELECT 100U M 16V
C5114	403 001 1906	CERAMIC 0.01U M 16V
C5115	403 135 4002	ELECT 47U M 6.3V
D5001	407 010 9403	DIODE S1WBA60
or	407 134 8900	DIODE DBC10G
D5003	407 091 6704	DIODE AP01C-VO
D5004	407 078 2705	DIODE 1SS244-T-77
D5005	407 078 2705	DIODE 1SS244-T-77
D5006	407 050 9302	ZENER DIODE GZB18C
D5007	407 078 2705	DIODE 1SS244-T-77
D5008	407 078 2705	DIODE 1SS244-T-77
D5009	407 006 0902	DIODE ERB12-02U14ATP
D5010	407 136 8809	DIODE ERA15-04A-V5
or	407 004 9808	DIODE DSK10E-BT
D5011	407 097 0300	PHOTO COUPLE PC113A
D5101	407 100 9108	DIODE DLE30C-KC9
D5104	407 100 6909	DIODE AG01-V2
or	407 091 6902	DIODE ERA38-04-V5
D5105	407 078 2705	DIODE 1SS244-T-77

Location	Part No.	Description
D5106	407 078 2705	DIODE 1SS244-T-77
D5107	407 100 6909	DIODE AG01-V2
or	407 091 6902	DIODE ERA38-04-V5
D5109	407 099 5105	ZENER DIODE MTZJ4.7B-T-77
D5110	407 012 4406	DIODE 1SS133-T-77
D5111	407 099 5204	ZENER DIODE MTZJ5.1B-T-77
D5113	407 051 4801	ZENER DIODE GZS2.0X-BT
or	407 125 9008	ZENER DIODE MTZJ2.0A-T-77
D5114	407 099 6508	ZENER DIODE MTZJ12A-T-77
D5115	407 099 6508	ZENER DIODE MTZJ12A-T-77
D5120	407 142 1108	DIODE RK44 LF-M1
F5001	423 006 1305	FUSE 250V 2A
IC511	409 067 7203	IC L5431-AA
IC512	409 234 7005	IC SI-3120CA
L5001	613 080 0664	LF CHOKE
or	613 119 9828	COIL,LINE FILTER
L5002	613 013 1362	LF CHOKE
L5101	613 017 0354	CORE
L5102	613 110 4198	COIL,INDUCTOR 10UH K
PR511	613 000 2327	CIRCUIT PROTECTOR
PR512	613 000 2327	CIRCUIT PROTECTOR
Q5001	405 103 7909	TR 2SK1460-YA
Q5002	405 017 9600	TR 2SC3330-T-AC
Q5003	405 105 0700	TR 2SB1050-R
Q5101	405 088 9103	TR 2SA1703-S-AN
or	405 108 6907	TR 2SB1322A-R (TA)
or	405 108 7003	TR 2SB1322A-S (TA)
Q5102	405 107 4102	TR 2SD1994-R (TA)
or	405 107 4201	TR 2SD1994-S (TA)
or	405 089 2103	TR 2SC4483-S-AN
Q5103	405 035 6902	TR 2SC3851-O
or	405 035 7008	TR 2SC3851-Y
Q5104	405 019 1909	TR 2SC536-E-NP-AA
or	405 019 2708	TR 2SC536-F-NP-AA
Q5105	405 018 2501	TR 2SC3399-AC
R5001	401 001 8000	SOLID 2.7M MA 1/2W
or	401 001 7904	SOLID 2.7M KA 1/2W
R5002	401 080 0605	WIRE WOUND 2.2 KA 2W
R5003	401 069 4402	OXIDE-MT 68K JA 2W
R5004	401 069 4402	OXIDE-MT 68K JA 2W
R5005	401 090 4709	OXIDE-MT 220K JA 1W
R5006	401 090 1104	CARBON 1M JA 1/2W
R5007	401 009 5001	CARBON 33 JA 1/2W
R5008	401 007 0305	CARBON 100 JA 1/2W
R5009	401 020 2805	CARBON 47K JA 1/4W
R5010	401 012 5609	CARBON 1K JA 1/4W
R5011	401 011 8809	CARBON 1 JA 1/4W
R5012	401 016 1409	CARBON 22 JA 1/4W
R5013	401 012 6903	CARBON 10K JA 1/4W
R5014	401 017 2702	CARBON 27K JA 1/4W
R5015	401 057 5107	OXIDE-MT 0.47 JA 1W

Location	Part No.	Description
R5101	402 004 0909	FUSIBLE RES 2.7 JA 1/4W
R5102	402 004 1302	FUSIBLE RES 220 JA 1/4W
R5103	401 016 3700	CARBON 2.2K JA 1/4W
R5104	401 015 2605	CARBON 1.8K JA 1/4W
R5105	401 107 6009	MT-FILM 1.6K FD 1/4W
R5106	401 107 1707	MT-FILM 2.2K FD 1/4W
R5107	401 012 4404	CARBON 100 JA 1/4W
R5108	401 014 5102	CARBON 15K JA 1/4W
R5109	401 021 8905	CARBON 6.2K JA 1/4W
R5110	401 016 3700	CARBON 2.2K JA 1/4W
R5111	401 012 5609	CARBON 1K JA 1/4W
R5112	401 016 3700	CARBON 2.2K JA 1/4W
R5113	401 016 3700	CARBON 2.2K JA 1/4W
R5114	401 011 5709	CARBON 820 JA 1/2W
R5115	401 011 5709	CARBON 820 JA 1/2W
R5117	401 013 6308	CARBON 12K JA 1/4W
T5001	613 126 5172	TRANS,SW
or	613 128 3824	TRANS,SW

MC-1 BOARD

Location	Part No.	Description
	613 123 9067	COMPL PCB,MC-1
R1	401 026 0607	CARBON 270 JA 1/6W
or	401 017 0708	CARBON 270 JA 1/4W
R2	401 024 6700	CARBON 100 JA 1/6W
or	401 012 4404	CARBON 100 JA 1/4W
R3	401 026 0607	CARBON 270 JA 1/6W
or	401 017 0708	CARBON 270 JA 1/4W
	613 022 4545	SPECIAL SWITCH
	407 094 1300	PHOTO COUPLE SPI-315-04-C
or	407 043 0101	PHOTO DIODE ON 2170-R

CIRCUIT DIAGRAMS & PRINTED CIRCUIT BOARDS

TLS-2000P

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TM-1 BOARD & CIRCUIT DIAGRAM Ⓔ

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PW-1 BOARD & CIRCUIT DIAGRAM Ⓘ

VP4Q-/SW, /E, /A '92

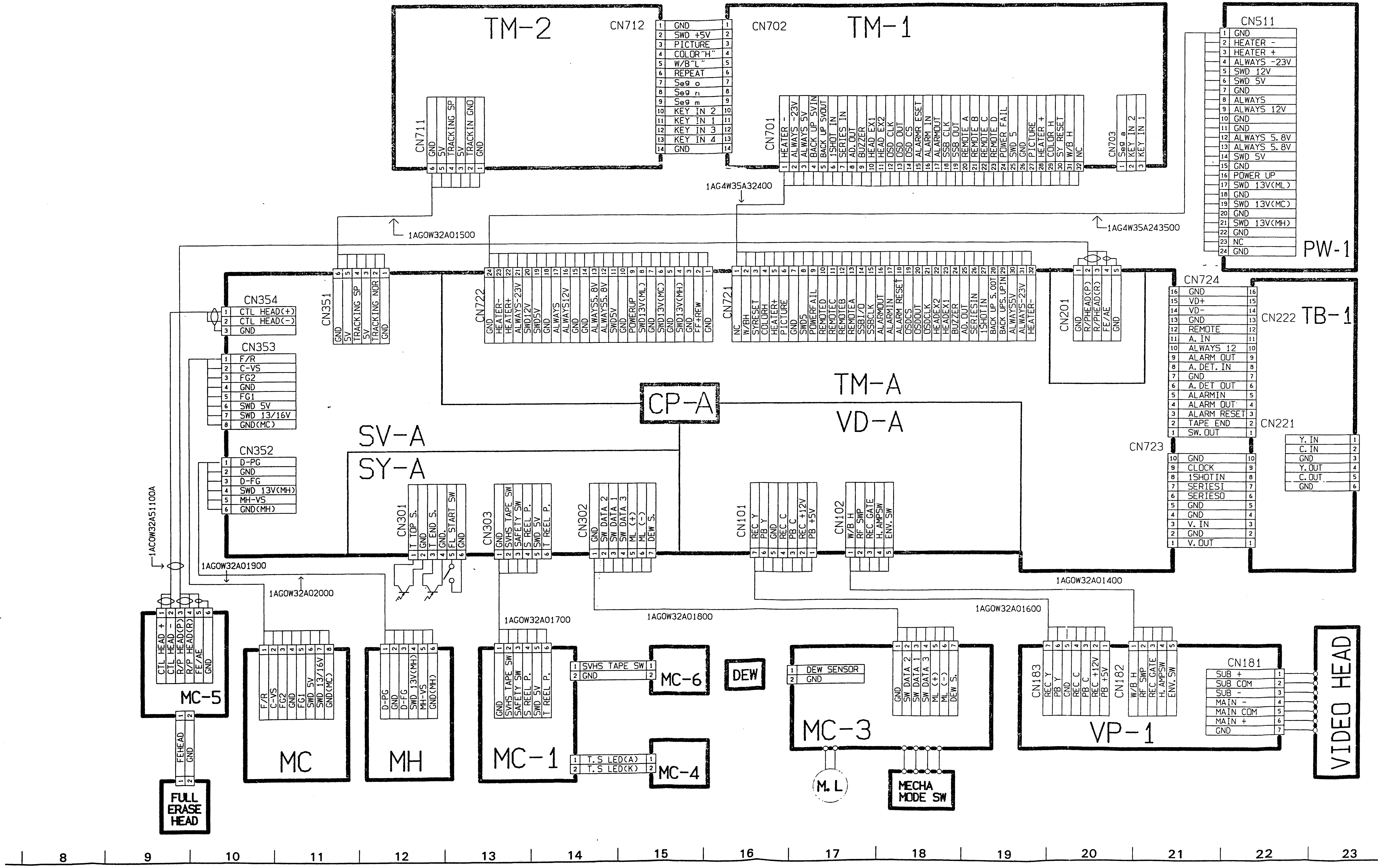
NOTES :

1. All resistance values in "OHMS" unless otherwise noted. (K=1,000 M=1,000,000)
2. All capacitance values in "μfd" unless otherwise noted. p=pico farad
3. All inductance values in "mH" unless otherwise noted. μ=micro henry

PRODUCT SAFETY NOTICE

THE COMPONENTS DESIGNATED BY A SYMBOL (⚠) IN THIS SCHEMATIC DIAGRAM DESIGNATES COMPONENTS WHOSE VALUE ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY. SHOULD ANY COMPONENT DESIGNATED BY A SYMBOL NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST. DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.

OVERALL WIRING DIAGRAM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CP-A
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CN352
CN351
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MH
MC-1
MC-6
MC-4
DEW
MC-3
M. L
MECHA MODE SW
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CN182
CN181
VIDEO HEAD
FULL ERASE HEAD
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1AG0W32A01400
GND
SWD +5V
PICTURE
COLOR"H"
W/B"L"
REPEAT
Seg o
Seg n
Seg m
KEY IN 2
KEY IN 1
KEY IN 3
KEY IN 4
TRACKING SP
TRACKIN GND
TRACKING NOR
HEATER -
HEATER +
ALWAYS -23V
SWD 12V
SWD 5V
ALWAYS
ALWAYS 12V
ALWAYS 5.8V
POWER UP
SWD 13V(ML)
SWD 13V(MC)
SWD 13V(MH)
NC
ALWAYS 5V
BACK UP 5VIN
BACK UP 5VOUT
1SHOT IN
SERIES IN
AD.OUT
BUZZER
HEAD EX1
HEAD EX2
OSD CLK
OSD OUT
OSD CS
ALARMR ESET
ALARM IN
ALARMOUT
SSB CLK
SSB OUT
REMOTE A
REMOTE B
REMOTE C
REMOTE D
POWER FAIL
PICTURE
COLOR H
SY RESET
W/B H
Seg a
FF+REW
POWERUP
R/PHEAD(P)
R/PHEAD(R)
FE/AE
VD+
VD-
REMOTE
A. IN
ALWAYS 12
ALARM OUT
A. DET. IN
A. DET OUT
ALARMIN
ALARM RESET
TAPE END
SW. OUT
CLOCK
1SHOTIN
SERIESI
SERIESO
V. IN
V. OUT
Y. IN
C. IN
Y. OUT
C. OUT
CTL HEAD(+)
CTL HEAD(-)
F/R
C-VS
FG2
FG1
SWD 13/16V
GND(MC)
D-PG
D-FG
MH-VS
GND(MH)
T.TOP S.
T.END S.
FL START SW
SVHS TAPE SW
SAFETY SW
S.REEL P.
T.REEL P.
SW DATA 2
SW DATA 1
SW DATA 3
ML (+)
ML (-)
DEW S.
REC Y
PB Y
REC C
PB C
REC +12V
PB +5V
RF SWP
REC GATE
H.AMPSW
ENV.SW
T.S LED(A)
T.S LED(K)
DEW SENSOR
FEHEAD
SUB +
SUB COM
SUB -
MAIN -
MAIN COM
MAIN +
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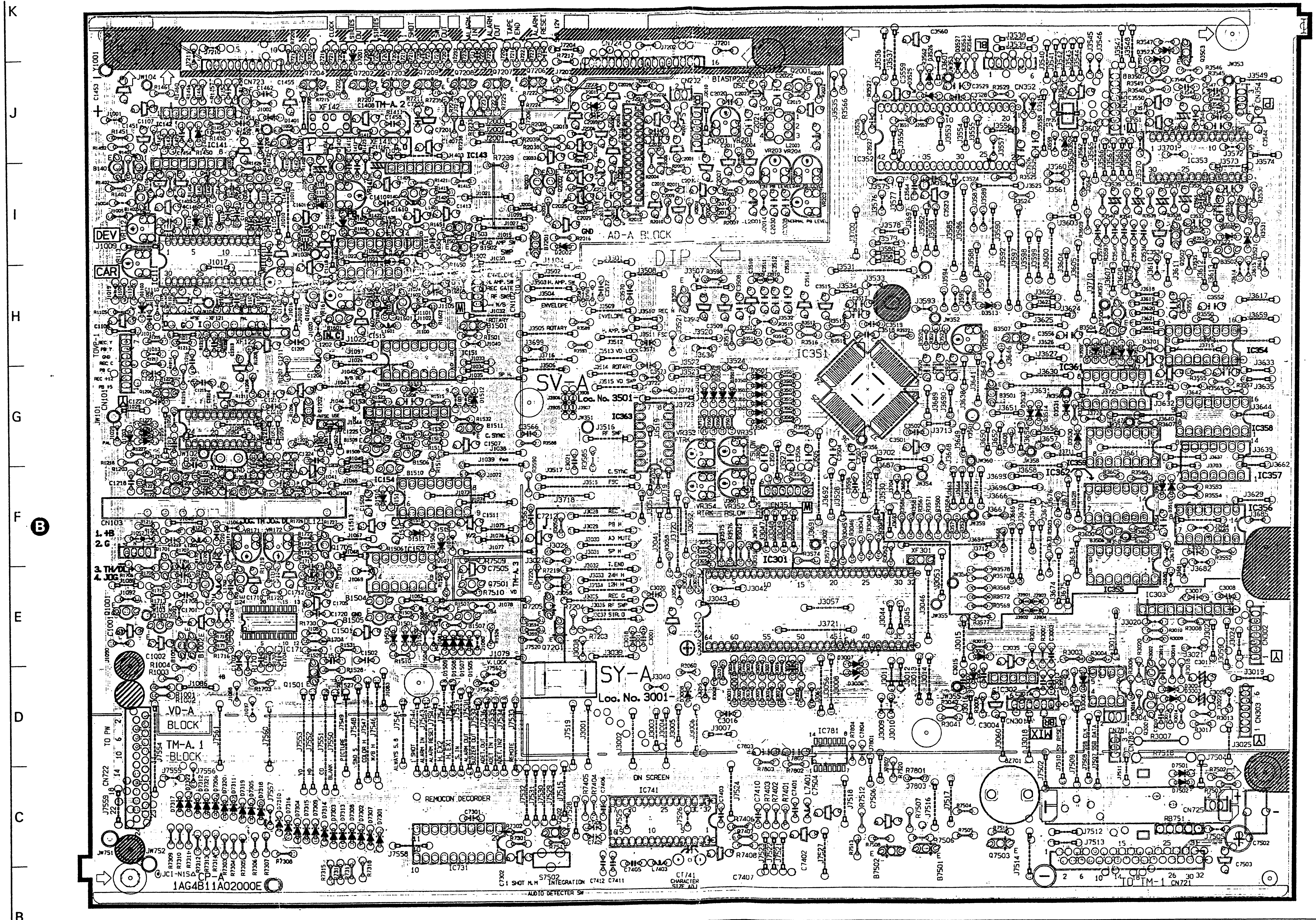
CP-A BOARD


K
J
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DIP
SV-A
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SY-A
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VD-A BLOCK
TM-A.1 BLOCK
TM-A.2
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IC301
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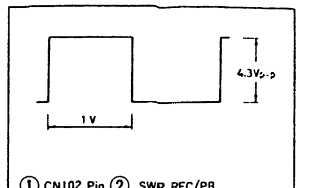
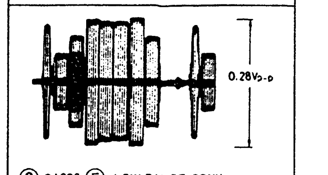
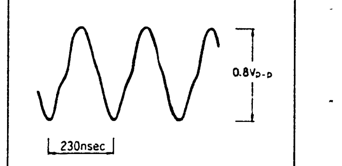
2. G
3. TH/DL
4. JOG
TO PW
CN722
REMOCON DECORDER
ON SCREEN
TO TM-1 CN721
CN725
CP-A
JC1-N15A
1AG4B11A02000E
AUDIO DETECTER SW



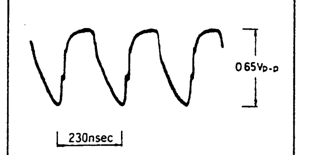
① CN102 Pin ②, SWP REC/PB



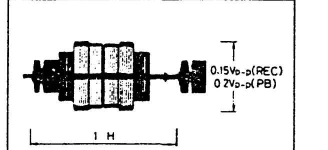
② Q1206 (E), LOW-RANGE CONV. CHROMA, REC



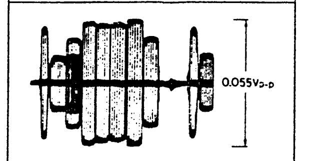
③ Q1201 (E), 3.58MHz, REC



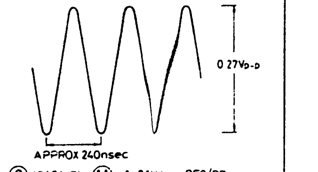
③ Q1201 (E), 3.58MHz, PB



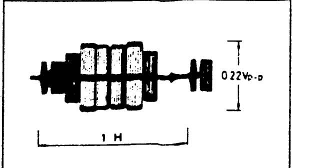
④ IC121 Pin ③, CHROMA, PB



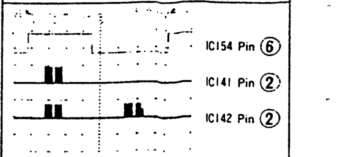
⑤ IC121 Pin ⑦, LOW-RANGE CONV. CHROMA, PB



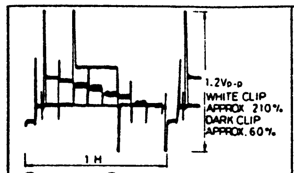
⑥ IC121 Pin ⑪, 4.21MHz, REC/PB



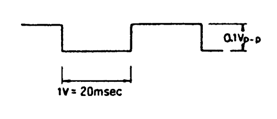
⑦ Q1204 (B), CHROMA PB



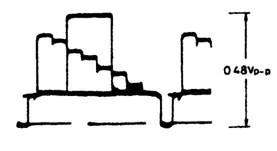
⑧ IC154 Pin ⑥, IC141 Pin ②, and IC141 Pin ②, 5V/2ms/div



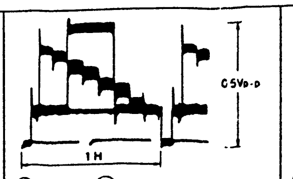
⑨ IC111 Pin ②, EMPHASIS, REC



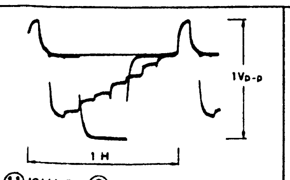
⑨ IC111 Pin ②, EMPHASIS, PB



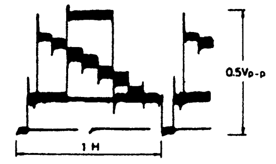
⑩ IC111 Pin ⑥, N CAN1 REC



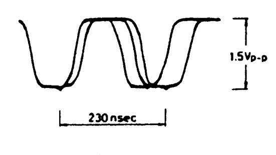
⑩ IC111 Pin ⑥, N CAN1 PB



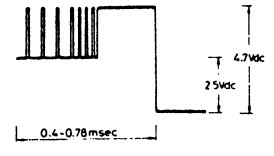
⑪ IC111 Pin ⑨, N CAN2 REC



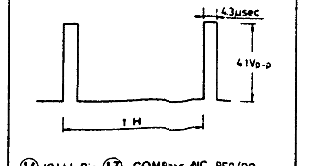
⑪ IC111 Pin ⑨, N CAN2 PB



⑫ IC111 Pin ㉚, DEVIATION, REC



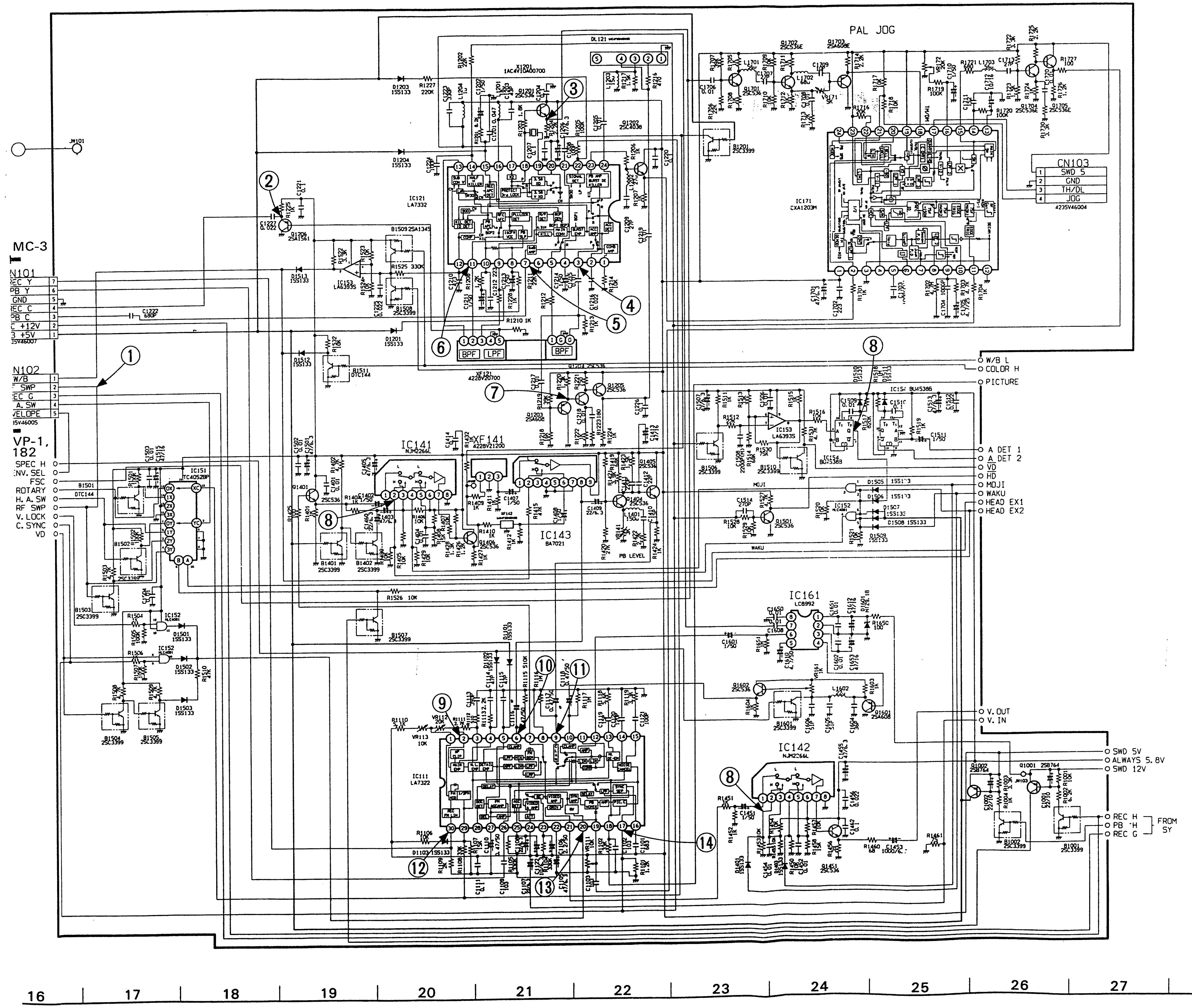
⑬ IC111 Pin ⑳, PB (48H · 480H)



⑭ IC111 Pin ⑰, COMP SYNC, REC/PB

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15

VD-A CIRCUIT


PAL JOG
MC-3
N101
REC Y
PB Y
GND
REC C
PB C
+12V
+5V
N102
W/B
SWP
REC G
A. SW
ENVELOPE
VP-1, 182
SPEC H
INV. SEL
FSC
ROTARY
H. A. SW
RF SWP
V. LOCK
C. SYNC
VD
JW101
IC121 LA7332
DL121
IC171 CXA1203M
CN103
SWD 5
GND
TH/DL
JOG
423SV46004
BPF
LPF
BPF
IC141 NJM2266L
XF141
IC143 BA7021
PB LEVEL
IC151 TC4052BP
IC152
IC153 LA6393S
IC154 BU4538B
IC161 LC8992
IC111 LA7322
IC142 NJM2266L
W/B L
COLOR H
PICTURE
A DET 1
A DET 2
VD
HD
MOJI
WAKU
HEAD EX1
HEAD EX2
V. OUT
V. IN
SWD 5V
ALWAYS 5.8V
SWD 12V
REC H
PB H
REC G
FROM SY
①
②
③
④
⑤
⑥
⑦
⑧
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⑩
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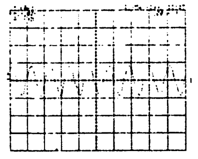
TERMINAL VOLTAGES

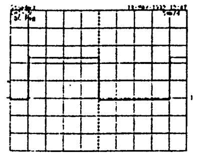
E-E mode				3-HOUR PLAY mode				3-HOUR REC mode			
Location No.	E	C	B	Location No.	E	C	B	Location No.	E	C	B
Q1001	11.91	0.32	11.90	Q1001	11.91	0.64	11.90	Q1001	11.82	11.75	11.10
Q1002	4.91	0	4.91	Q1002	4.87	4.82	4.13	Q1002	4.90	0.18	4.90
Q1201	2.37	4.98	2.99	Q1201	1.73	4.96	2.32	Q1201	2.40	4.98	3.01
Q1202	1.72	4.99	2.37	Q1202	1.30	4.96	1.94	Q1202	1.72	4.99	2.37
Q1203	2.25	0	1.60	Q1203	2.23	0	1.59	Q1203	2.25	0	1.60
Q1204	1.60	3.78	2.25	Q1204	2.84	3.77	2.23	Q1204	1.61	3.79	2.25
Q1205	3.11	4.99	3.78	Q1205	3.10	4.96	3.77	Q1205	3.12	4.99	3.79
Q1206	0	4.99	0.49	Q1206	1.49	4.96	2.15	Q1206	0	4.99	0.49
Q1401	1.82	4.99	2.46	Q1401	1.74	4.93	2.57	Q1401	1.82	4.99	2.46
Q1404	0.74	2.92	1.36	Q1404	0.72	2.94	1.35	Q1404	0.74	2.93	1.36
Q1405	2.26	4.99	2.92	Q1405	2.27	4.94	2.94	Q1405	2.27	4.99	2.93
Q1451	0.85	4.99	1.55	Q1451	1.64	4.94	2.36	Q1451	0.83	4.99	1.54
Q1501	0	0.01	0.66	Q1501	0	4.50	0.04	Q1501	0	0.01	0.65
Q1406				Q1406	2.88	4.94	3.57	Q1406	2.56	4.99	3.24
Q1601	3.67	0	3.00	Q1601	3.65	0	3.03	Q1601	3.64	0	2.97
Q1602	6.21	8.65	6.88	Q1602	6.23	8.66	6.90	Q1602	6.15	8.58	6.82
Q1701	1.04	3.87	1.67	Q1701	1.02	3.84	1.66	Q1701	1.04	3.86	1.67
Q1702	1.75	3.18	2.39	Q1702	1.72	3.16	2.37	Q1702	1.75	3.17	2.39
Q1703	2.38	0	1.74	Q1703	2.37	0	1.73	Q1703	2.38	0	1.75
Q1704	0.91	2.89	1.54	Q1704	0.90	2.87	1.53	Q1704	0.91	2.87	1.54
Q1705	2.23	4.91	2.89	Q1705	2.21	4.87	2.87	Q1705	2.22	4.90	2.87
B1001	0	11.90	0	B1001	0	11.89	0	B1001	0	0.03	5.07
B1002	0	4.91	0	B1002	0	0.04	5.06	B1002	0	4.90	0
B1401	0	4.53	0	B1401	0	0.02	4.95	B1401	0	4.53	0.18
B1402	0	0	4.53	B1402	0	1.02	0.02	B1402	0	0	4.53
B1501	0	0	4.86	B1501	0	2.46	2.46	B1501	0	2.47	2.46
B1502	0	4.94	0	B1502	0	4.91	0	B1502	0	4.94	0
B1503	0	0.02	4.44	B1503	0	2.49	2.20	B1503	0	2.50	2.07
B1504	0	4.54	0	B1504	0	4.52	0	B1504	0	4.54	0
B1505	0	0.02	4.54	B1505	0	0.02	4.52	B1505	0	0.02	4.54
B1506	0	0.06	3.83	B1506	0	0.06	3.79	B1506	0	0.06	3.82
B1507	0	0.10	0.34	B1507	0	0.10	0.52	B1507	0	0	12.07
B1508	0	1.97	0	B1508	0	1.95	0	B1508	0	1.97	0
B1509	5.00	1.97	4.89	B1509	4.97	1.95	4.86	B1509	5.00	1.97	4.89
B1510	0	0.02	4.88	B1510	0	0.02	4.85	B1510	0	0.02	4.88
B1511	0	0.01	4.89	B1511	0	0.01	4.86	B1511	0	0.01	4.89
B1601	0	5.89	0	B1601	0	5.89	0	B1601	0	5.84	0

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)	Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)	Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC111	1	2.44	2	2.66	IC111	1	3.65	2	2.72	IC111	1	2.46	2	2.68
	3	2.66	4	3.37		3	2.33	4	2.69		3	2.67	4	3.39
	5	2.85	6	3.55		5	4.52	6	1.12		5	2.86	6	3.56
	7	2.87	8	0		7	2.68	8	0		7	2.92	8	0
	9	0.93	10	3.54		9	3.54	10	3.54		9	0.87	10	3.55
	11	0.27	12	3.06		11	0.28	12	3.08		11	0.26	12	3.08
	13	4.45	14	4.45		13	3.28	14	3.28		13	4.47	14	4.47
	15	4.45	16	3.57		15	4.10	16	3.49		15	4.47	16	3.58
	17	0.35	18	2.45		17	0.35	18	2.44		17	0.35	18	2.84
	19	4.26	20	0.02		19	4.24	20	0.15		19	4.27	20	4.50
	21	2.49	22	4.98		21	2.53	22	2.78		21	2.49	22	4.99
	23	3.69	24	3.24		23	2.78	24	3.73		23	3.66	24	3.24
	25	2.93	26	3.54		25	3.94	26	3.63		25	2.94	26	3.56
	27	1.49	28	0.01		27	1.21	28	0.01		27	1.46	28	0
	29	2.29	30	3.44		29	2.66	30	4.13		29	2.67	30	3.49
IC121	1	0.04	2	1.38	IC121	1	0.04	2	1.56	IC121	1	0.04	2	1.39
	3	3.18	4	2.50		3	3.18	4	2.49		3	3.20	4	2.50
	5	1.66	6	0		5	2.67	6	0		5	1.64	6	0
	7	3.18	8	2.73		7	3.18	8	2.68		7	3.20	8	2.68
	9	1.91	10	2.73		9	4.32	10	2.69		9	1.94	10	2.68
	11	2.59	12	1.94		11	2.58	12	1.94		11	2.59	12	1.94
	13	4.63	14	0.46		13	4.62	14	0.46		13	4.64	14	0.46
	15	2.28	16	4.99		15	2.30	16	4.97		15	2.25	16	5.00
	17	4.62	18	3.03		17	4.56	18	2.35		17	4.62	18	3.06
	19	3.94	20	4.99		19	3.91	20	4.97		19	3.95	20	5.00
	21	1.66	22	0.24		21	1.63	22	2.52		21	1.64	22	2.52
	23	2.37	24	3.23		23	1.96	24	3.37		23	2.41	24	3.25
IC141	1	2.53	2	0.16	IC141	1	2.97	2	4.70	IC141	1	2.53	2	0.14
	3	2.50	4	0.08		3	2.48	4	0		3	2.50	4	0.06
	5	3.02	6	4.98		5	3.01	6	4.97		5	3.03	6	4.99
	7	2.34	8	0		7	2.28	8	0		7	2.43	8	0
IC142	1	2.54	2	0.22	IC142	1	2.57	2	0.01	IC142	1	2.55	2	0.23
	3	2.49	4	0.14		3	2.49	4	0.01		3	2.50	4	0.15
	5	3.01	6	4.98		5	3.00	6	4.97		5	3.01	6	4.99
	7	2.36	8	0		7	2.45	8	0		7	2.37	8	0
IC151	1	0	2	4.98	IC151	1	0.01	2	2.50	IC151	1	0	2	2.50
	3	0	4	0.01		3	0.01	4	2.23		3	0	4	2.07
	5	4.93	6	0		5	4.92	6	0		5	4.94	6	0
	7	0	8	0		7	0	8	0		7	0	8	0
	9	0.10	10	0.10		9	0.10	10	0.10		9	0	10	0.10
	11	0	12	0.07		11	0	12	2.47		11	0	12	2.47
	13	0.09	14	4.94		13	2.47	14	2.47		13	2.47	14	2.48
	15	4.99	16	4.99		15	4.97	16	4.97		15	5.00	16	5.00
IC152	1	0.17	2	2.27	IC152	1	0.07	2	4.70	IC152	1	0.17	2	2.25
	3	0.08	4	0.16		3	0	4	4.70		3	0.06	4	0.14
	5	0.22	6	2.25		5	4.41	6	4.70		5	0	6	0
	7	0	8	0.35		7	4.70	8	0.35		7	0	8	3.80
	9	0	10	0		9	0	10	0		9	0	10	0
	11	0	12	0		11	0	12	0		11	4.99	12	4.94
	13	5.01	14	5.01		13	4.99	14	4.99		13	5.03	14	5.03
IC153	1	4.99	2	4.30	IC153	1	4.97	2	4.27	IC153	1	5.01	2	0.07
	3	1.89	4	2.49		3	1.89	4	2.48		3	1.98	4	2.50
	5	0	6	2.66		5	0	6	2.66		5	0	6	3.72
	7	4.35	8	0.25		7	4.32	8	0.25		7	0.06	8	4.89
	9	4.99				9	4.98				9	5.01		
IC154	1	0	2	3.34	IC154	1	0	2	3.35	IC154	1	0	2	5.33
	3	5.76	4	0		3	5.76	4	0		3	5.76	4	0
	5	0.25	6	2.50		5	0.25	6	2.50		5	4.88	6	0
	7	3.19	8	0		7	3.19	8	0		7	5.76	8	0
	9	5.76	10	0		9	5.76	10	0		9	5.76	10	0
	11	5.76	12	0		11	5.76	12	0		11	5.76	12	0
	13	5.76	14	5.24		13	5.76	14	5.25		13	5.76	14	5.25
	15	0	16	5.76		15	0	16	5.76		15	0	16	5.76
IC161	1	8.65	2	0	IC161	1	8.66	2	0	IC161	1	8.58	2	0
	3	12.70	4	2.99		3	12.76	4	3.03		3	12.63	4	2.97
	5	4.22	6	2.98		5	4.38	6	3.24		5	4.17	6	2.96
	7	1.98	8	2.78		7	1.98	8	2.78		7	1.98	8	2.78
IC171	1	4.91	2	1.62	IC171	1	4.87	2	1.25	IC171	1	4.90	2	1.62
	3	0	4	2.46		3	0	4	2.45		3	0	4	2.45
	5	3.54	6	0.07		5	2.87	6	0.05		5	3.54	6	0.04
	7	2.09	8	2.52		7	2.08	8	2.56		7	2.09	8	2.52
	9	0.81	10	0.47		9	2.08	10	0.88		9	0.87	10	0.46
	11	3.71	12	0		11	0.32	12	0		11	3.70	12	0
	13	4.23	14	2.13		13	4.23	14	2.12		13	4.23	14	2.12
	15	2.05	16	1.80		15	0.01	16	1.77		15	2.05	16	1.79
	17	0	18	2.39		17	3.91	18	2.36		17	0.02	18	2.38
	19	4.91	20	0.02		19	4.87	20	0.01		19	4.90	20	0.01
	21	4.90	22	4.45		21	4.87	22	4.43		21	4.89	22	4.45
	23	4.91	24	1.44		23	4.87	24	1.43		23	4.90	24	1.44

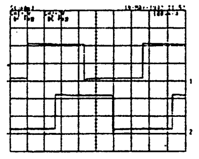
SV-A CIRCUIT



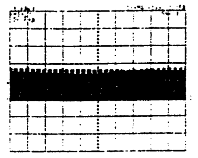
㉑ IC351 Pin ㊹, REC/PB, 200mV/200ns/div



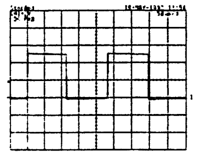
㉙ IC351 Pin ③, REC/PB, 2V/5ms/div



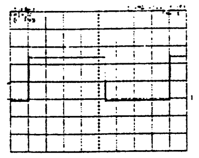
㉒ IC351 Pins ㉓, ㉔, 3H REC/PB, 2V/100µs/div



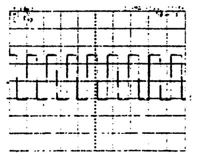
㉚ IC351 Pin ㊻, 3H, REC, 2V/5ms/div



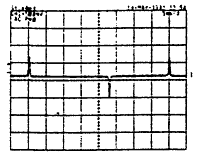
㉓ IC351 Pin ㉑, 3H REC/PB, 2V/50µs/div



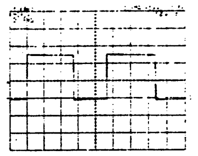
㉛ IC352 Pin ㉛, 3H, PB, 2V/5ms/div



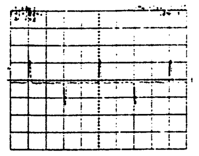
㉔ IC351 Pin ⑳, 3H REC/PB, 2V/50µs/div



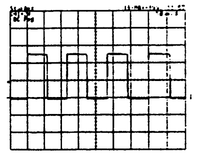
㉜ IC353 Pin ④, 3H PB, 500mV/5ms/div



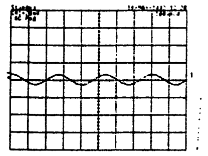
㉕ IC351 Pin ⑯, 3H REC/PB, 2V/50µs/div



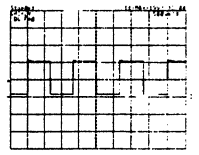
㉝ CN352 Pin ①, 3H REC/PB, 100mV/10ms/div



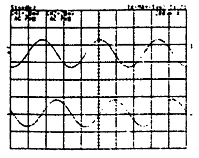
㉖ IC351 Pin ⑭, 3H REC/PB, 2V/50µs/div



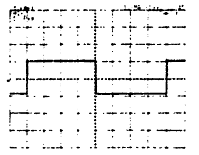
㉞ CN352 Pin ③, 3H REC/PB, 20mV/500µs/div



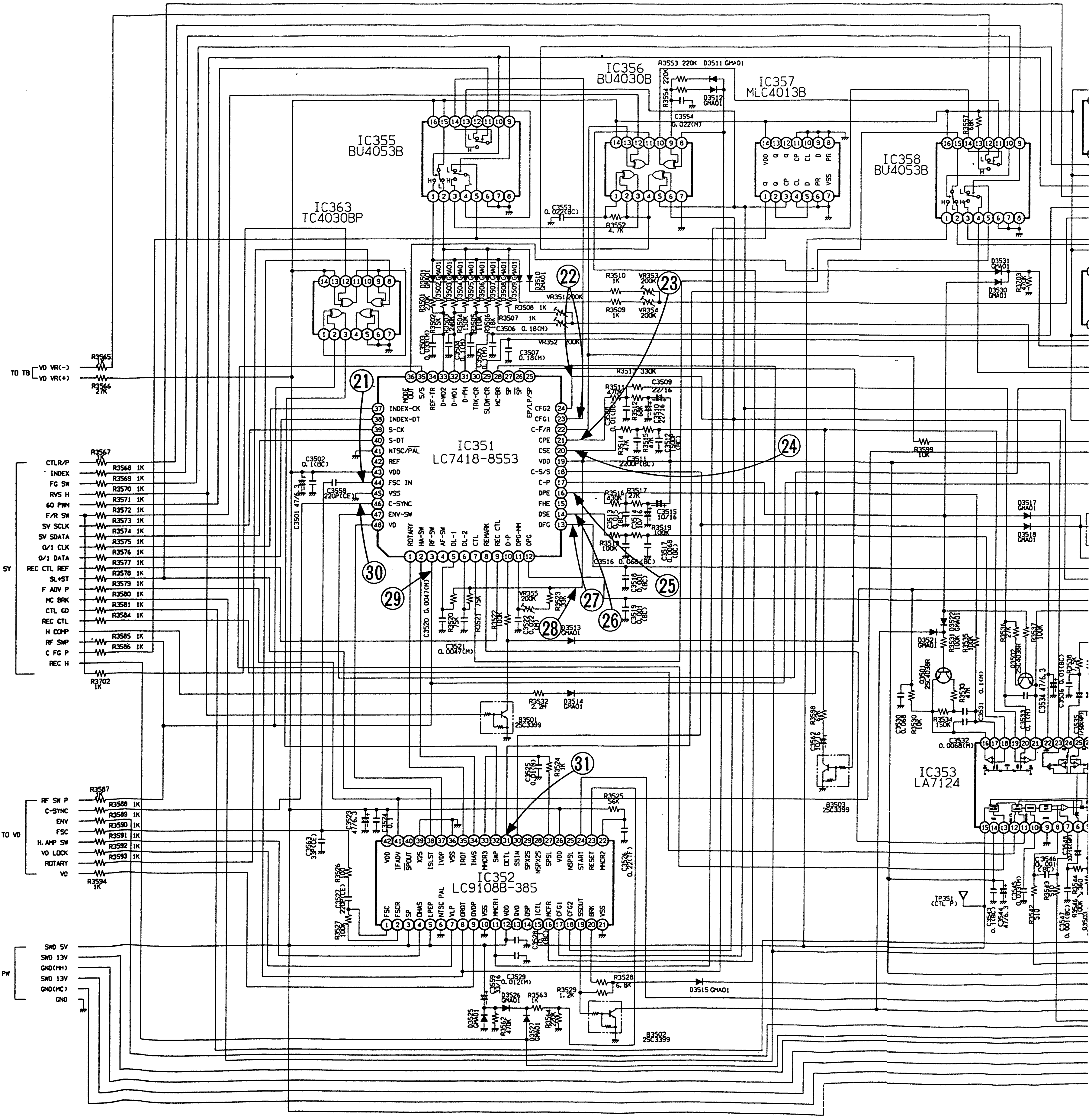
㉗ IC351 Pin ⑬, REC/PB, 2V/500µs/div



㉟ CN353 Pins ③, ⑤ 3H REC/PB, 20mV/200µs/div



㉘ IC351 Pin ⑫, REC/PB, 2V/5ms/div


IC355 BU4053B
IC356 BU4030B
IC357 MLC4013B
IC358 BU4053B
IC363 TC4030BP
IC351 LC7418-8553
IC352 LC9108B-385
IC353 LA7124
TO TB
VD VR(-)
VD VR(+)
TO SY
CTLR/P
INDEX
FG SW
RVS H
60 PWM
F/R SW
SV SCLK
SV SDATA
0/1 CLK
0/1 DATA
REC CTL REF
SL+ST
F ADV P
MC BRK
CTL GO
REC CTL
H COMP
RF SWP
C FG P
REC H
TO VD
RF SW P
C-SYNC
ENV
FSC
H.AMP SW
VD LOCK
ROTARY
VC
TO PW
SWD 5V
SWD 13V
GND(MH)
SWD 13V
GND(MC)
GND
INDEX-CK
INDEX-DT
S-CK
S-DT
NTSC/PAL
REF
VDD
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VSS
C-SYNC
ENV-SW
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C-F/R
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CSE
C-S/S
C-P
DPE
FHE
DSE
DFG
Q3501 2SC3399
Q3502 2SC3399
Q3503 2SC3399
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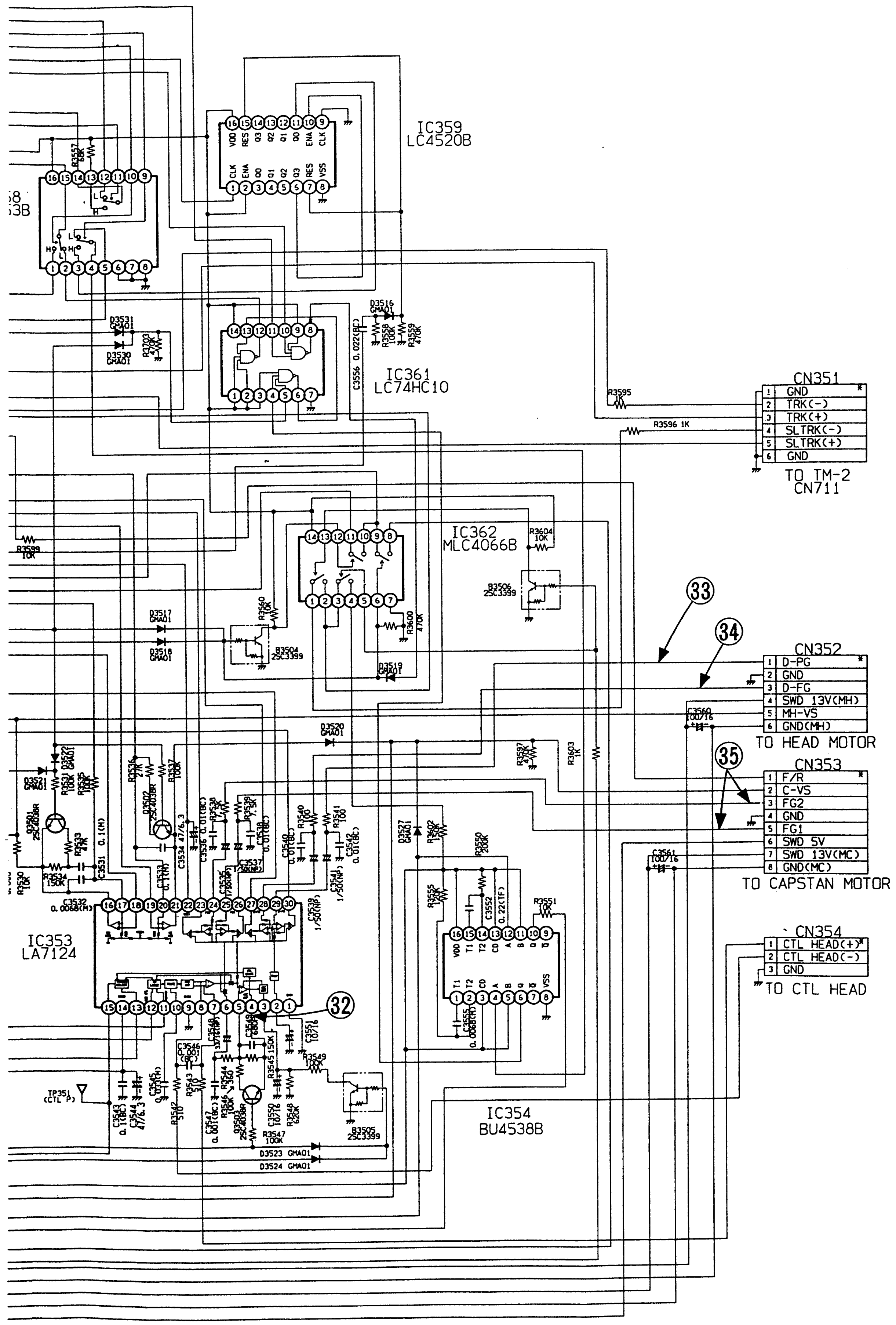


TERMINAL VOLTAGES

E-E mode

Location No.	E	C	B
Q3501	0	0	0.02
Q3502	0	2.51	0.01
Q3503	2.55	2.53	0
B3501	0	0	0
B3502	0	0	0
B3503	0	−0.13	0.01
B3504	0	0.01	4.52
B3505	0	0.82	0
B3506	0	5.03	0

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC351	1	5.04	2	0
	3	4.91	4	5.04
	5	0.02	6	5.01
	7	0	8	0
	9	0.07	10	0
	11	0.02	12	0.51
	13	4.34	14	0
	15	0.07	16	2.54
	17	0	18	0
	19	5.04	20	0
	21	2.54	22	5.04
	23	0	24	0.51
	25	5.04	26	5.01
	27	0	28	0
	29	0.02	30	0.72
	31	0.06	32	0.01
	33	0.07	34	2.54
	35	0	36	0
	37	0	38	0
	39	5.06	40	5.06
	41	0	42	2.53
	43	5.04	44	2.50
	45	0	46	0.35
	47	0	48	0
IC352	1	2.49	2	2.53
	3	5.03	4	0
	5	5.03	6	0
	7	0	8	5.01
	9	0	10	0
	11	4.99	12	5.03
	13	0	14	5.03
	15	0	16	5.03
	17	0	18	0.52
	19	0	20	0
	21	0	22	5.00
	23	0	24	0
	25	0.12	26	0.01
	27	0	28	0.09
	29	0.08	30	0
	31	0	32	4.91
	33	0	34	0
	35	5.04	36	0
	37	0	38	0
	39	0	40	0
	41	0	42	5.03
IC353	1	0	2	2.54
	3	0.83	4	2.55
	5	2.55	6	2.55
	7	0.01	8	0.01
	9	0	10	0.01
	11	0	12	0
	13	0	14	5.03
	15	0	16	0
	17	2.50	18	0.01
	19	0.01	20	2.51
	21	0	22	5.03
	23	0.51	24	2.55
	25	2.55	26	0
	27	4.34	28	2.55
	29	2.54	30	0.51
IC354	1	0	2	4.98
	3	5.03	4	0
	5	5.03	6	0
	7	5.03	8	0
	9	5.03	10	0
	11	5.03	12	0
	13	5.03	14	4.93
	15	0	16	5.03
IC355	1	−0.04	2	4.94
	3	0	4	5.02
	5	0	6	0
	7	0	8	0
	9	0	10	0
	11	5.02	12	0
	13	0	14	5.02
	15	5.03	16	5.03

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC356	1	0	2	0
	3	0	4	0
	5	0	6	0.51
	7	0	8	5.01
	9	4.68	10	0
	11	5.03	12	0
	13	5.04	14	5.03
IC357	1	5.02	2	5.03
	3	0	4	0
	5	5.03	6	0
	7	0	8	0
	9	0	10	0
	11	0	12	5.03
	13	0	14	5.03
IC358	1	0	2	0
	3	0.20	4	0
	5	0	6	0
	7	0	8	0
	9	0	10	0
	11	0	12	4.99
	13	5.00	14	5.00
	15	0	16	5.03
IC359	1	0	2	5.02
	3	0	4	5.02
	5	0	6	0
	7	0	8	0
	9	0	10	4.48
	11	4.48	12	0
	13	0.20	14	0
	15	0	16	4.49
IC361	1	5.02	2	5.02
	3	0	4	0
	5	5.02	6	5.02
	7	0	8	5.02
	9	5.02	10	0
	11	0	12	0
	13	5.02	14	5.02
IC362	1	0.06	2	0.02
	3	0.02	4	5.00
	5	0	6	4.00
	7	0	8	0
	9	0	10	0
	11	4.91	12	0.01
	13	5.03	14	5.03
IC363	1	1.48	2	3.78
	3		4	0
	5	0	6	1.49
	7	0	8	1.09
	9	4.99		

3-HOUR PLAY mode

Location No.	E	C	B
Q3501	2.44	2.24	0.17
Q3502	2.95	2.50	0
Q3503	2.56	2.53	0
B3501	0	0	0
B3502	0	0	0
B3503	2.56	2.53	0
B3504	0	0.01	4.23
B3505	0	1.28	0
B3506	0	5.01	0

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC351	1	2.52	2	0
	3	2.45	4	2.52
	5	0.06	6	0.07
	7	2.74	8	0
	9	0.08	10	0
	11	0.19	12	2.46
	13	2.46	14	2.55
	15	0	16	2.62
	17	0.01	18	0.01
	19	5.03	20	2.58
	21	2.48	22	0.01
	23	2.42	24	2.43
	25	0.01	26	0.01
	27	5.03	28	0
	29	0.03	30	0.72
	31	0.06	32	0.01
	33	0.07	34	2.52
	35	0.01	36	0
	37	0.01	38	0
	39	5.05	40	5.05
	41	0	42	2.52
	43	5.03	44	2.50
	45	0	46	0.35
	47	4.59	48	0
IC352	1	2.48	2	2.52
	3	5.02	4	0
	5	5.02	6	0
	7	0	8	2.51
	9	0	10	0
	11	4.91	12	5.02
	13	0	14	5.02
	15	2.76	16	5.02
	17	2.42	18	2.43
	19	0	20	0
	21	0	22	4.99
	23	0	24	0
	25	0.15	26	5.02
	27	1.83	28	0.12
	29	0.11	30	0.01
	31	2.93	32	2.45
	33	1.83	34	0
	35	2.51	36	0
	37	0	38	0
	39	0	40	0
	41	0	42	5.02
IC353	1	0	2	2.54
	3	1.31	4	2.56
	5	2.55	6	2.55
	7	0.01	8	0.01
	9	0	10	0.01
	11	0	12	0
	13	0.01	14	5.02
	15	2.76	16	2.43
	17	2.52	18	2.48
	19	2.49	20	2.51
	21	2.96	22	5.02
	23	2.43	24	2.55
	25	2.55	26	2.42
	27	2.46	28	2.55
	29	2.54	30	2.46
IC354	1	0	2	4.88
	3	5.02	4	2.96
	5	5.02	6	0.10
	7	4.93	8	0
	9	5.02	10	0
	11	5.02	12	0
	13	5.02	14	4.92
	15	0	16	5.02
IC355	1	−0.02	2	4.93
	3	1.95	4	2.52
	5	2.52	6	0
	7	0	8	0
	9	0	10	0
	11	5.05	12	2.51
	13	2.42	14	2.42
	15	5.02	16	5.02

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC356	1	2.51	2	2.53
	3	1.95	4	2.53
	5	2.42	6	2.43
	7	0	8	2.50
	9	2.45	10	1.01
	11	5.02	12	5.05
	13	0.01	14	5.02
IC357	1	2.51	2	2.52
	3	2.42	4	0
	5	2.52	6	0
	7	0	8	0
	9	0	10	0
	11	0	12	5.02
	13	0	14	5.02
IC358	1	2.73	2	0.10
	3	0.68	4	2.94
	5	2.97	6	0
	7	0	8	0
	9	0	10	5.05
	11	1.01	12	4.98
	13	4.92	14	4.91
	15	2.74	16	5.02
IC359	1	2.53	2	4.74
	3	2.37	4	2.37
	5	2.37	6	2.37
	7	0	8	0
	9	0	10	2.37
	11	2.37	12	2.37
	13	0.68	14	2.86
	15	0	16	4.74
IC361	1	4.74	2	4.74
	3	2.37	4	2.37
	5	2.37	6	4.15
	7	0	8	4.74
	9	4.74	10	0
	11	0	12	0.69
	13	4.15	14	4.74
IC362	1	0.06	2	0.03
	3	0.03	4	4.99
	5	0	6	4.24
	7	0	8	4.59
	9	4.59	10	4.59
	11	2.45	12	0.01
	13	5.02	14	5.02
IC363	1	1.45	2	3.75
	3		4	0
	5	0	6	1.47
	7	0	8	1.05
	9	4.96		

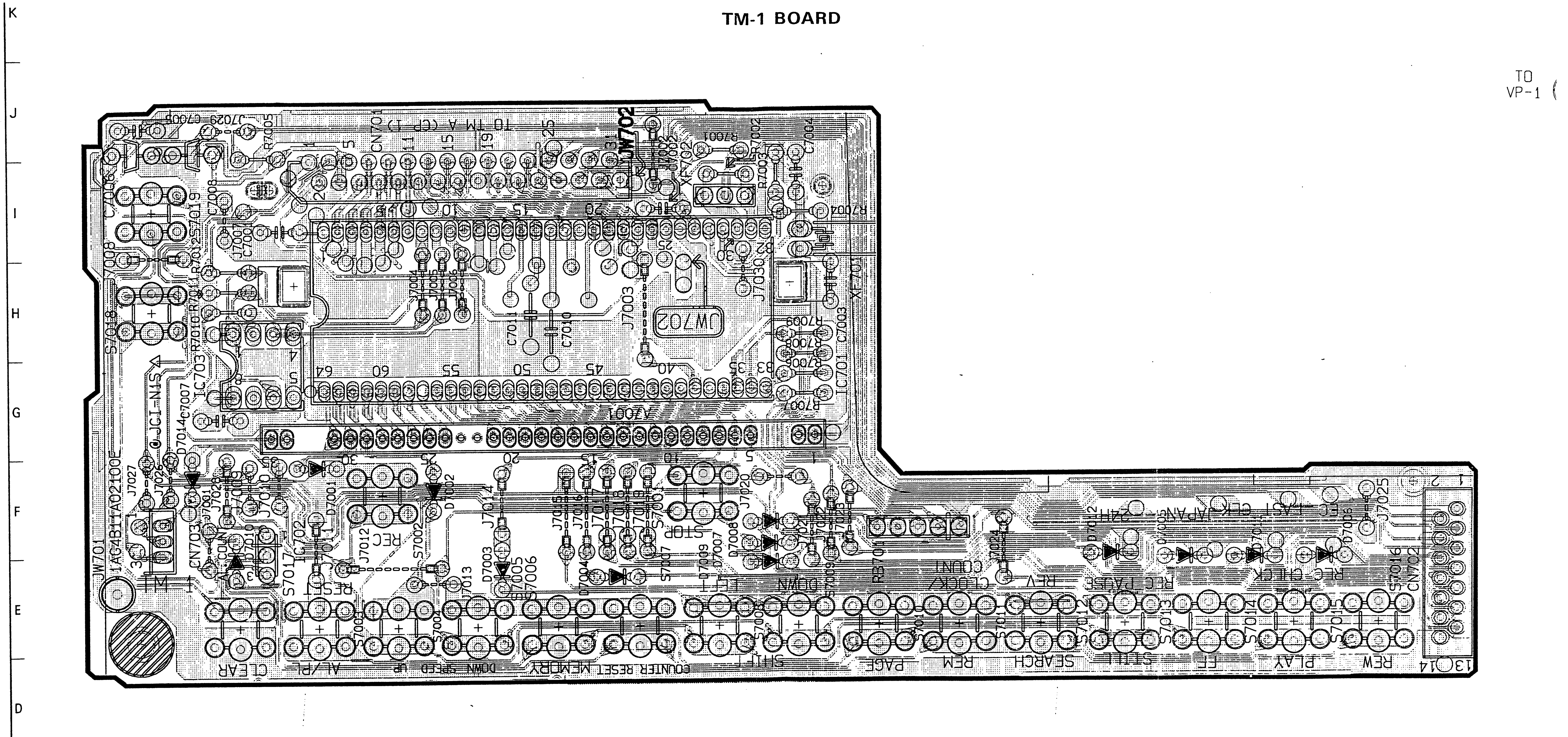
3-HOUR REC mode

Location No.	E	C	B
Q3501	2.43	2.24	0.10
Q3502	2.95	2.51	0
Q3503	2.55	2.53	0
B3501	0	0	0
B3502	0	0	0
B3503	0	0.97	0
B3504	0	0.01	4.25
B3505	0	0.82	0
B3506	0	0.01	4.89

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC351	1	2.52	2	0
	3	2.43	4	2.53
	5	0.06	6	0.07
	7	2.76	8	5.05
	9	1.40	10	0
	11	0.19	12	2.47
	13	2.48	14	2.56
	15	0	16	2.65
	17	0	18	0.01
	19	5.05	20	2.59
	21	2.49	22	0.01
	23	2.46	24	2.45
	25	0.01	26	0.01
	27	5.05	28	0
	29	0.02	30	0.72
	31	0.07	32	0.01
	33	0.08	34	2.53
	35	0.01	36	0
	37	0.01	38	0
	39	5.05	40	5.05
	41	0	42	2.53
	43	5.05	44	2.51
	45	0	46	3.83
	47	3.85	48	0
IC352	1	2.50	2	2.54
	3	5.04	4	0
	5	5.04	6	0
	7	5.04	8	2.52
	9	0	10	0
	11	5.00	12	0
	13	0	14	5.04
	15	2.74	16	5.04
	17	2.43	18	2.44
	19	0	20	0
	21	0	22	5.01
	23	4.57	24	0
	25	5.04	26	5.04
	27	5.04	28	0.06
	29	0.06	30	0.01
	31	5.04	32	2.43
	33	5.04	34	0
	35	2.52	36	0
	37	0	38	0
	39	0	40	0
	41	0	42	5.04
IC353	1	0	2	2.55
	3	0.83	4	2.55
	5	2.55	6	2.52
	7	2.20	8	1.56
	9	0	10	4.99
	11	5.05	12	2.68
	13	0.01	14	5.04
	15	2.77	16	2.44
	17	2.53	18	2.49
	19	2.50	20	2.53
	21	2.95	22	5.04
	23	2.45	24	2.55
	25	2.55	26	2.44
	27	2.47	28	2.55
	29	2.55	30	2.47
IC354	1	0	2	4.43
	3	5.04	4	0.68
	5	5.04	6	0.21
	7	4.83	8	0
	9	5.04	10	0
	11	5.04	12	0
	13	5.04	14	4.94
	15	0	16	5.04
IC355	1	0.01	2	4.96
	3	1.96	4	2.53
	5	2.53	6	0
	7	0	8	0
	9	0	10	0
	11	5.05	12	2.52
	13	2.44	14	2.44
	15	5.04	16	5.05

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC356	1	2.53	2	2.54
	3	1.96	4	2.54
	5	2.44	6	2.45
	7	0	8	2.51
	9	2.46	10	1.01
	11	5.05	12	5.05
	13	0.01	14	5.04
IC357	1	2.53	2	2.53
	3	2.44	4	0
	5	2.53	6	0
	7	0	8	0
	9	0	10	1.01
	11	0	12	5.04
	13	0	14	5.04
IC358	1	2.73	2	0.21
	3	0.68	4	0.68
	5	5.04	6	0
	7	0	8	0
	9	5.05	10	5.05
	11	1.01	12	5.00
	13	5.01	14	5.00
	15	2.74	16	5.04
IC359	1	2.54	2	4.76
	3	2.39	4	2.38
	5	2.38	6	2.38
	7	0	8	0
	9	0	10	2.38
	11	2.38	12	2.38
	13	0.69	14	2.50
	15	0	16	4.76
IC361	1	4.76	2	4.76
	3	2.38	4	2.38
	5	2.38	6	4.17
	7	0	8	4.75
	9	4.76	10	0
	11	0	12	0.68
	13	4.15	14	4.76
IC362	1	4.71	2	0.02
	3	0.02	4	0.05
	5	4.90	6	4.25
	7	0	8	3.85
	9	3.84	10	3.84
	11	2.43	12	0.01
	13	0.01	14	5.04
IC363	1	1.29	2	0
	3		4	0
	5	0	6	1.30
	7	0	8	0.94
	9	5.00		

TM-1 BOARD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IC703
JW701
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XE701
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RESET
REC
STOP
EDIT
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REC CHECK
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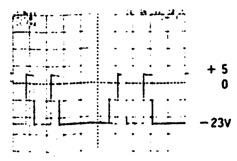
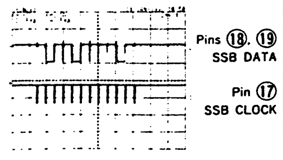
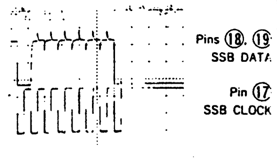
JAPAN
FAST



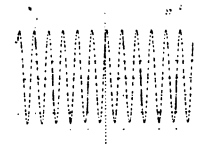
(61) IC701 Pin ㊵. 10V/2ms/div



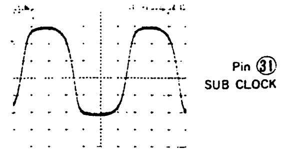
(62) IC701 Pins ⑰, ⑱ & ⑲. 5V/2ms/div



(62) IC701 Pins ⑰. ⑱ & ⑲. 2V/20μs/div

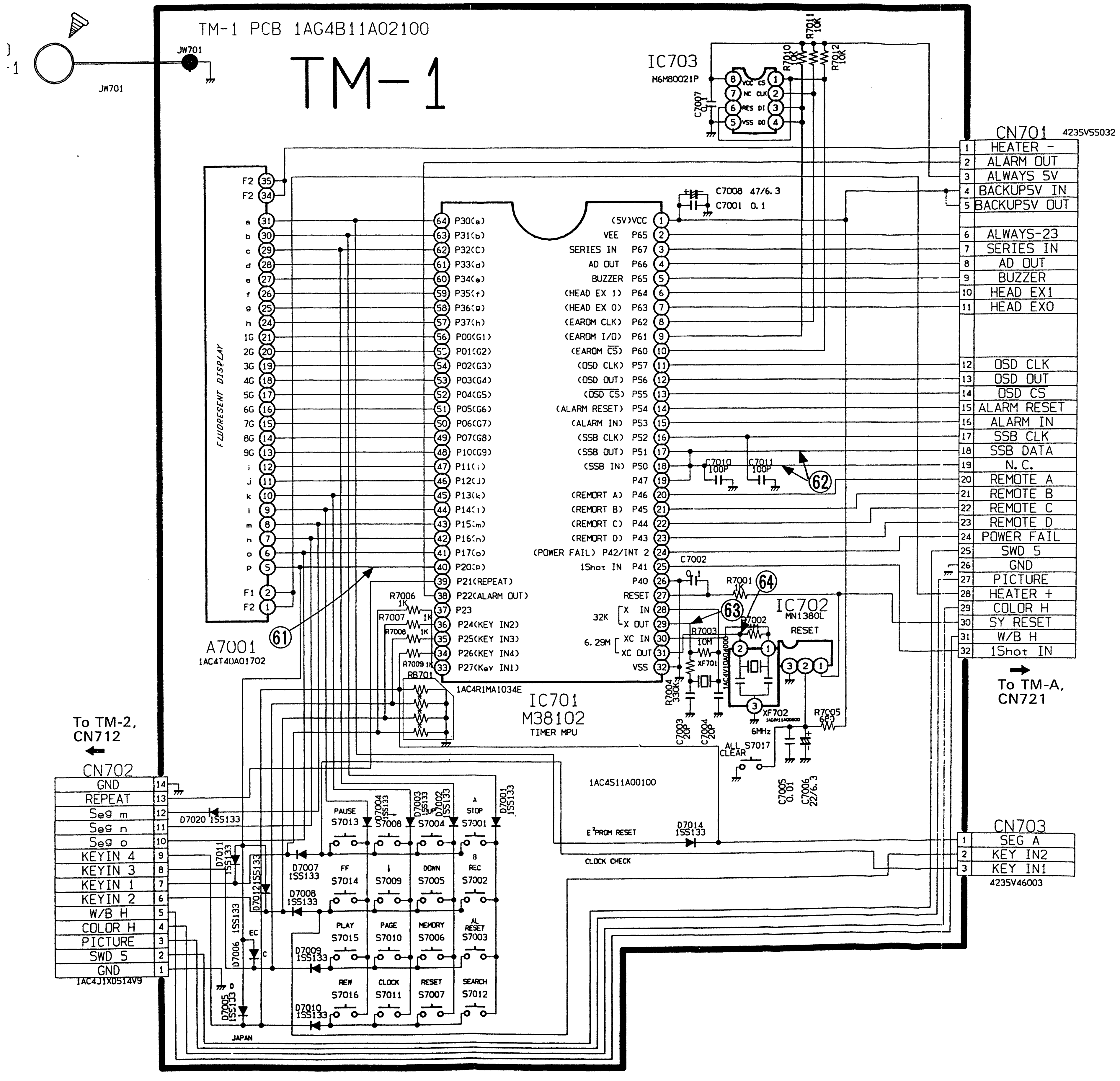


(63) IC701 Pin ㉙. MAIN CLOCK.
1V/200ns/div



(64) IC701 Pin ㉛. 1V/5μs/div

TM-1 CIRCUIT


TM-1 PCB 1AG4B11A02100
TM-1
JW701
IC703
M6M80021P
C7007
R7010 10K
R7011 10K
R7012 10K
VCC CS
NC CLK
RES DI
VSS DO
C7008 47/6.3
C7001 0.1
FLUORESCENT DISPLAY
A7001
1AC4T40A01702
IC701
M38102
TIMER MPU
1AC4R1MA1034E
RB701
(5V)VCC
VEE P65
SERIES IN P67
AD OUT P66
BUZZER P65
(HEAD EX 1) P64
(HEAD EX 0) P63
(EAROM CLK) P62
(EAROM I/O) P61
(EAROM CS) P60
(OSD CLK) P57
(OSD OUT) P56
(OSD CS) P55
(ALARM RESET) P54
(ALARM IN) P53
(SSB CLK) P52
(SSB OUT) P51
(SSB IN) P50
P47
(REMORT A) P46
(REMORT B) P45
(REMORT C) P44
(REMORT D) P43
(POWER FAIL) P42/INT 2
1Shot IN P41
P40
RESET
32K X IN
X OUT
6.29M XC IN
XC OUT
VSS
P30(a)
P31(b)
P32(c)
P33(d)
P34(e)
P35(f)
P36(g)
P37(h)
P00(G1)
P01(G2)
P02(G3)
P03(G4)
P04(G5)
P05(G6)
P06(G7)
P07(G8)
P10(G9)
P11(i)
P12(j)
P13(k)
P14(l)
P15(m)
P16(n)
P17(o)
P20(p)
P21(REPEAT)
P22(ALARM OUT)
P23
P24(KEY IN2)
P25(KEY IN3)
P26(KEY IN4)
P27(KEY IN1)
R7006 1K
R7007 1K
R7008 1K
R7009 1K
C7002
R7001 1K
C7010 100P
C7011 100P
IC702
MN1380L
RESET
R7003 10M
R7002
XF701
XF702
6MHz
R7004 330K
C7003 20P
C7004 20P
R7005 68
ALL CLEAR S7017
C7005 0.01
C7006 22/6.3
1AC4S11A00100
E²PROM RESET
D7014 1SS133
CLOCK CHECK
CN701 4235V55032
1 HEATER -
2 ALARM OUT
3 ALWAYS 5V
4 BACKUP5V IN
5 BACKUP5V OUT
6 ALWAYS-23
7 SERIES IN
8 AD OUT
9 BUZZER
10 HEAD EX1
11 HEAD EX0
12 OSD CLK
13 OSD OUT
14 OSD CS
15 ALARM RESET
16 ALARM IN
17 SSB CLK
18 SSB DATA
19 N.C.
20 REMOTE A
21 REMOTE B
22 REMOTE C
23 REMOTE D
24 POWER FAIL
25 SWD 5
26 GND
27 PICTURE
28 HEATER +
29 COLOR H
30 SY RESET
31 W/B H
32 1Shot IN
To TM-A, CN721
CN703
1 SEG A
2 KEY IN2
3 KEY IN1
4235V46003
To TM-2, CN712
CN702
14 GND
13 REPEAT
12 Seg m
11 Seg n
10 Seg o
9 KEYIN 4
8 KEYIN 3
7 KEYIN 1
6 KEYIN 2
5 W/B H
4 COLOR H
3 PICTURE
2 SWD 5
1 GND
1AC4J1X0514V9
D7020 1SS133
D7011 1SS133
D7012 1SS133
D7006 1SS133
D7005 1SS133
EC
C
D
JAPAN
D7007 1SS133
D7008 1SS133
D7009 1SS133
D7010 1SS133
D7004 1SS133
D7003 1SS133
D7002 1SS133
D7001 1SS133
PAUSE S7013
↑ S7008
UP S7004
A STOP S7001
FF S7014
↓ S7009
DOWN S7005
B REC S7002
PLAY S7015
PAGE S7010
MEMORY S7006
AL RESET S7003
REW S7016
CLOCK S7011
RESET S7007
SEARCH S7012
61
62
63
64

TERMINAL VOLTAGES

E-E/PLAY/REC modes

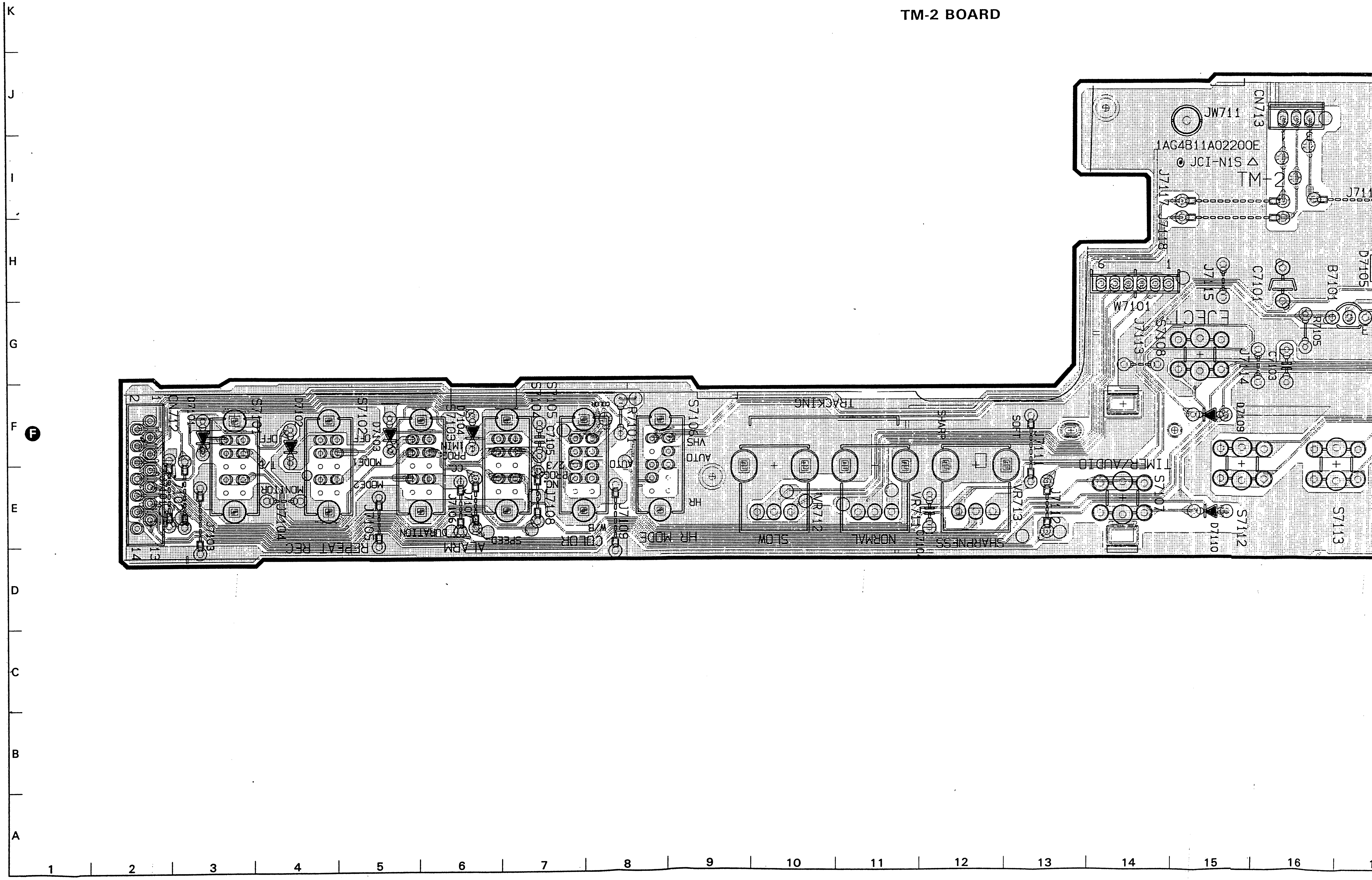
Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC701	1	5.02	2	0
	3	0	4	0.10
	5	0.10	6	0.09
	7	0.09	8	5.10
	9	5.10	10	5.10
	11	3.94	12	1.65
	13	0.87	14	0
	15	0	16	0.03
	17	4.91	18	4.56
	19	4.57	20	4.73
	21	4.76	22	4.74
	23	4.74	24	4.65
	25	0.07	26	0
	27	5.02	28	2.17
	29	1.96	30	2.20
	31	2.44	32	0
	33	2.62	34	1.20
	35	0.80	36	0.40
	37	0	38	−23.91
	39	4.97	40	−23.77
	41	−16.00	42	−18.40
	43	−21.20	44	−18.50
	45	−16.00	46	−16.00
	47	−15.60	48	−21.50
	49	−21.50	50	−21.50
	51	−21.50	52	−21.50
	53	−21.50	54	−21.50
	55	−21.50	56	−21.50
	57	−23.85	58	−18.60
	59	−21.20	60	−18.70
	61	−21.20	62	−23.82
	63	−18.50	64	−15.50
IC702	1	5.11	2	5.03
	3	0		
IC703	1	5.11	2	5.11
	3	5.11	4	5.11
	5	0	6	5.10
	7	5.11	8	5.11

TM-1
Difference of each model

model	A	B	C	D	
VN4Q-/U	S7001	S7002	——	——	
VN4Q-/U-SY	S7018	S7019	——	——	
VN4Q-/U-JV	S7001	S7002	——	——	
VN4Q-/J	S7001	S7002	——	D7005	
VN4Q-/J-SY	S7018	S7019	——	D7005	
VP4Q-/SW	S7001	S7002	D7006	——	
VP4Q-/E	S7001	S7002	D7006	——	
VP4Q-/A	S7001	S7002	D7006	——	
VP4Q-/EXSY	S7018	S7019	D7006	——	
VP4Q-/EXJV	S7001	S7002	D7006	——	

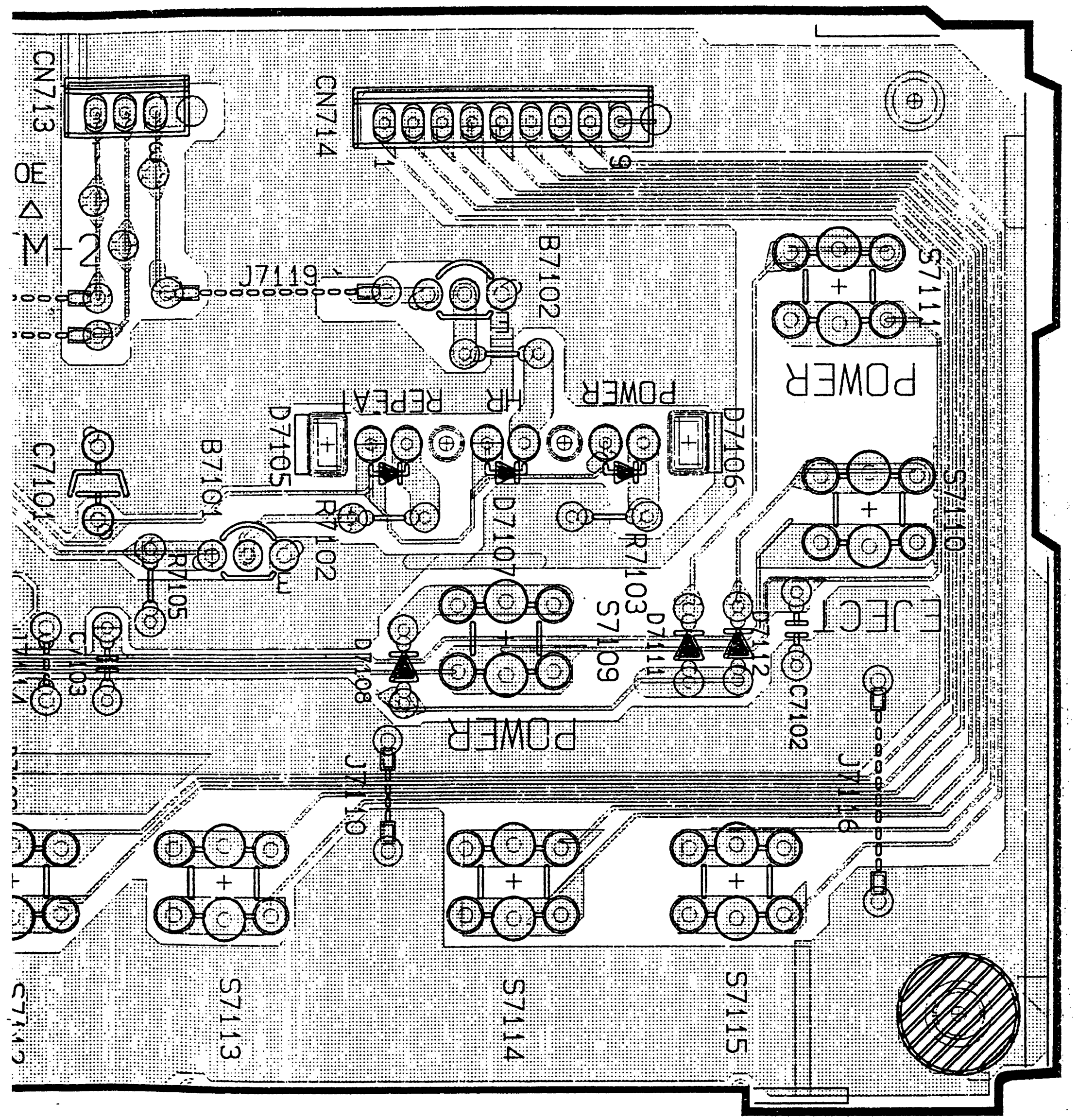
—— - - - NO EXIT
S7001. S7002 - - - 1AC4S11A00100
S7018. S7019 - - - 1AC4S11A01100

TM-2 BOARD

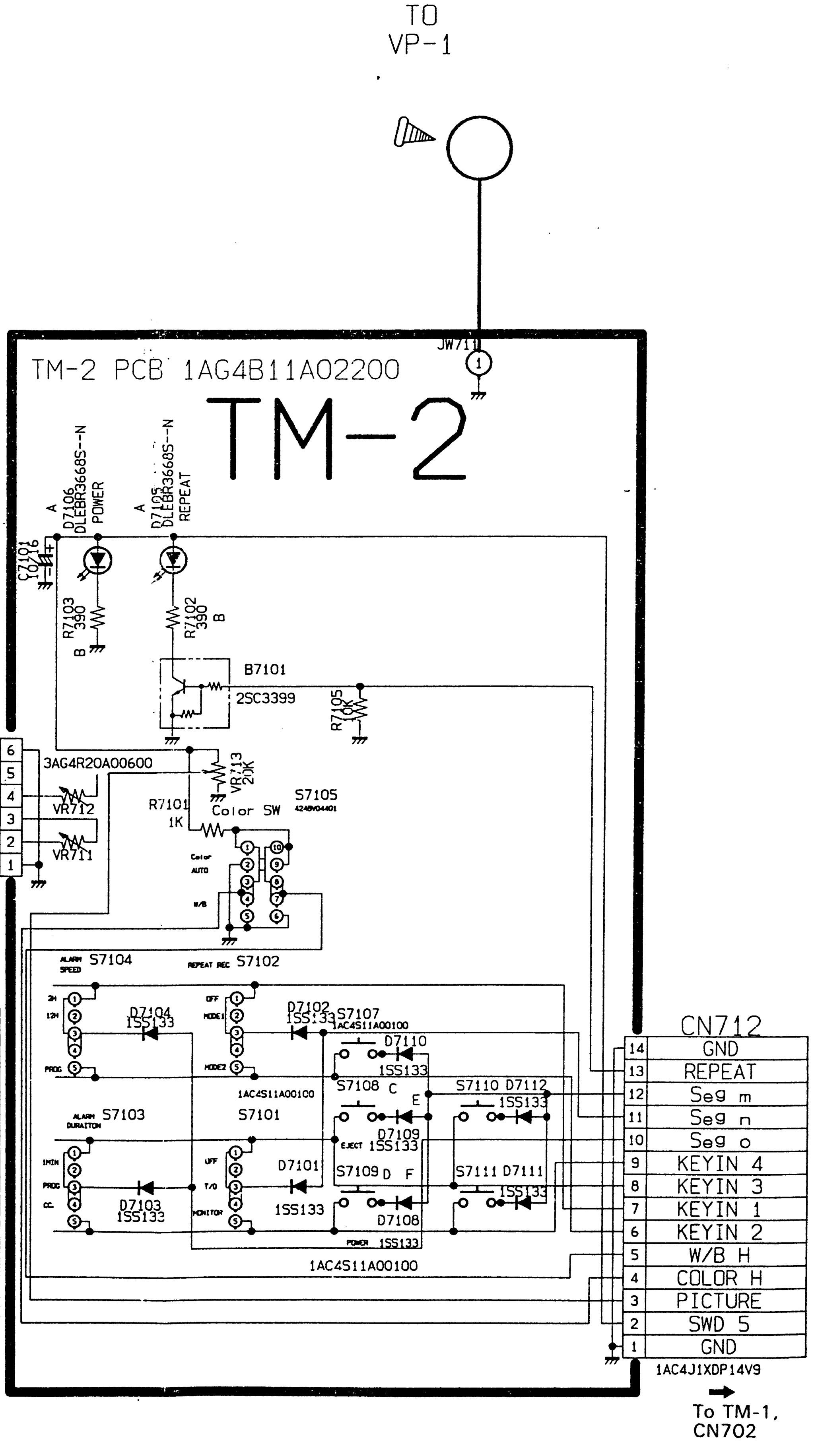


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
F
CN713
JW711
1AG4B11A02200E
JCI-N1S
TM-2
W7101
C7101
B7101
D7105
EJECT
S7108
TRACKING
SHARP
SOFT
TIMER/AUDIO
S7107
S7112
S7113
D7110
D7109
VR713
VR712
VR711
SLOW
NORMAL
SHARPNESS
HR MODE
COLOUR
ALARM
SPEED
DURATION
REPEAT REC
MONITOR
S7101
S7102
S7103
S7104
S7105
S7106
D7101
D7102
D7103
D7104
VHS
AUTO
HR
PROG
MODE1
MODE2
OFF

TM-2 CIRCUIT



CN713
CN714
J7119
B7102
S7111
POWER
REPEAT
HR
D7105
D7106
B7101
C7101
R7102
R7105
D7107
R7103
S7110
S7109
EJECT
D7111
D7112
D7108
C7102
C7103
POWER
J7110
J7116
S7113
S7114
S7115



TO
VP-1
JW711
TM-2 PCB 1AG4B11A02200
TM-2
D7106
DLEBR3668S-N
POWER
D7105
DLEBR3668S-N
REPEAT
C7101
R7103
390
R7102
390
B7101
2SC3399
R7105
W7101
GND
5V
Tracking SP
5V
Tracking NOR
GND
3AG4R20A00600
VR712
VR711
VR713
20K
R7101
1K
Color SW
S7105
S7104
S7102
D7104
1SS133
D7102
1SS133
S7107
1AC4S11A00100
D7110
1SS133
S7108
S7110
D7112
1SS133
S7103
S7101
D7109
1SS133
D7101
S7109
S7111
D7111
1SS133
D7103
1SS133
1SS133
D7108
1SS133
1AC4S11A00100
CN712
14 GND
13 REPEAT
12 Seg m
11 Seg n
10 Seg o
9 KEYIN 4
8 KEYIN 3
7 KEYIN 1
6 KEYIN 2
5 W/B H
4 COLOR H
3 PICTURE
2 SWD 5
1 GND
1AC4J1XDP14V9
To TM-1,
CN702

ボードイン
TO SV

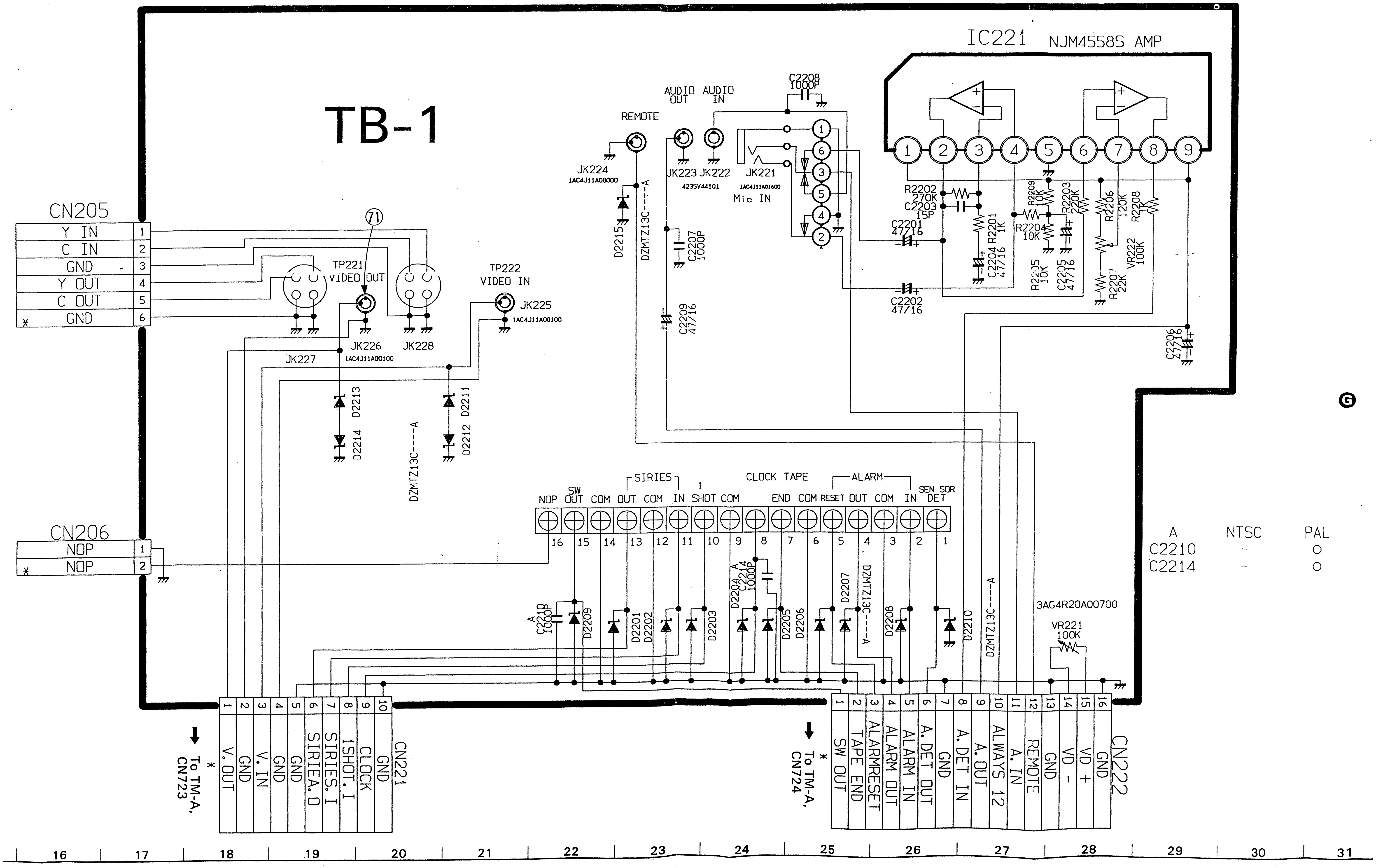
TM-2

Difference of each model

model	A	B	C	D	E	F
VN4Q-/U	Red	390	S7108	S7109	D7109	——
VN4Q-/U-SY	Green	180	S7110	S7111	D7112	D7111
VN4Q-/U-JV	Red	390	S7108	S7109	D7109	——
VN4Q-/J	Red	390	S7108	S7109	D7109	D7108
VN4Q-/J-SY	Green	180	S7110	S7111	D7112	D7111
VP4Q-/SW	Red	390	S7108	S7109	D7109	D7108
VP4Q-/E	Red	390	S7108	S7109	D7109	D7108
VP4Q-/A	Red	390	S7108	S7109	D7109	D7108
VP4Q-/EXSY	Green	180	S7110	S7111	D7112	D7111
VP4Q-/EXJV	Red	390	S7108	S7109	D7109	D7108

Red----DLEBR3668S
Green---DLPG3932SY
S7108, S7109---1AC4S11A00100
S7110, S7111---1AC4S11A01100

TB-1 CIRCUIT


TB-1
IC221 NJM4558S AMP
CN205
Y IN
C IN
GND
Y OUT
C OUT
GND
*
1
2
3
4
5
6
TP221 VIDEO OUT
71
TP222 VIDEO IN
JK225
1AC4J11A00100
JK226
1AC4J11A00100
JK227
JK228
D2213
D2214
D2211
D2212
DZMTZ13C---A
REMOTE
JK224
1AC4J11A08000
D2215
DZMTZ13C---A
AUDIO OUT
AUDIO IN
JK223
JK222
4235V44101
JK221
1AC4J11A01600
Mic IN
C2207 1000P
C2208 1000P
C2209 47/16
R2202 270K
C2203 15P
C2201 47/16
R2201 1K
C2204 47/16
C2202 47/16
R2209 10K
R2204 10K
R2203 220K
R2205 10K
C2205 47/16
R2206 120K
R2208 1K
R2207 22K
VR222 100K
C2206 47/16
CN206
NOP
NOP
SIRIES
1
CLOCK TAPE
ALARM
NOP
SW OUT
COM
OUT
COM
IN
SHOT
COM
END
COM
RESET
OUT
COM
IN
SEN SOR DET
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
A C2210 1000P
D2209
D2201
D2202
D2203
D2204 A
C2214 1000P
D2205
D2206
D2207
DZMTZ13C---A
D2208
D2210
DZMTZ13C---A
3AG4R20A00700
VR221 100K
CN221
V. OUT
GND
V. IN
GND
GND
SIRIEA. O
SIRIES. I
1SHOT. I
CLOCK
GND
* To TM-A, CN723
CN222
SW OUT
TAPE END
ALARMRESET
ALARM OUT
ALARM IN
A. DET OUT
GND
A. DET IN
A. OUT
ALWAYS 12
A. IN
REMOTE
GND
VD -
VD +
GND
* To TM-A, CN724
G
16
17
18
19
20
21
22
23
24
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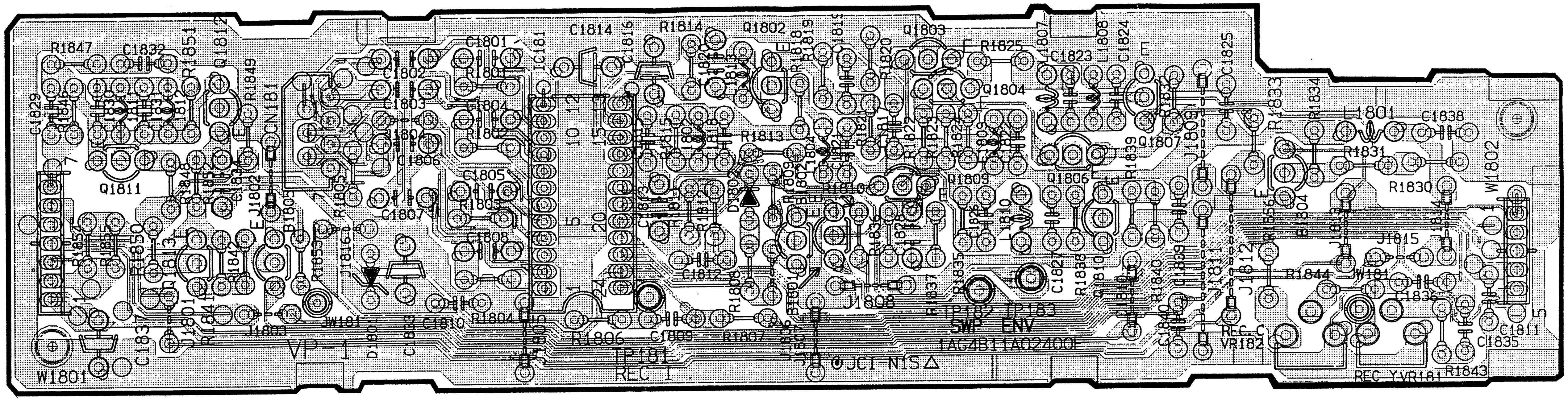
30
31

A	NTSC	PAL
C2210	-	○
C2214	-	○

VP-1 BOARD


R1847
C1832
R1851
Q1812
R1849
CN181
C1829
Q1811
J1802
J1805
R1850
R1842
J1803
JW181
D1801
C1810
R1804
C1801
C1802
C1803
C1804
C1805
C1806
C1807
C1808
R1801
R1802
R1803
IC181
C1814
C1816
R1814
Q1802
R1818
R1819
R1813
Q1803
R1820
R1825
Q1804
Q1807
L1808
C1823
C1824
C1825
R1833
R1834
L1801
C1838
R1831
R1830
W1802
Q1806
Q1809
R1839
J1809
R1806
C1809
R1807
TP181
REC I
C1812
J1808
TP182
TP183
SWP
ENV
1AG4B11A02400E
JCI-N1S
R1835
R1837
R1838
R1840
C1839
C1840
J1811
J1812
R1844
W181
J1815
C1836
C1811
C1835
REC C
VR182
REC Y
VR181
R1843
VP-1
W1801
C1837
C1833

TERMINAL VOLTAGES

E-E mode

Location No.	E	C	B
Q1802	0	0	0
Q1803	0	0	0
Q1804	0	0	0
Q1806	0	0	0
Q1807	0	0	0
Q1809	0	0	0
Q1810	0	0	0
Q1811	2.13	2.12	1.45
Q1812	0.43	0	2.12
Q1813	0.43	0.85	0.29
B1801	0	2.40	0
B1802	0	2.21	0.42
B1804	0	0	3.80
B1805	0	0	3.80

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC181	1	0	2	0
	3	0	4	0
	5	0	6	0
	7	0	8	0
	9	0	10	0
	11	0	12	0
	13	0	14	0
	15	0.30	16	0
	17	0	18	0
	19	0	20	2.01
	21	0	22	0.13
	23	0.42	24	0

3-HOUR PLAY mode

Location No.	E	C	B
Q1802	0	0	0
Q1803	2.25	0	1.64
Q1804	1.59	3.19	2.25
Q1806	2.60	4.75	3.19
Q1807	0	0.01	0
Q1809	2.25	3.62	2.90
Q1810	2.96	4.75	3.63
Q1811	2.28	2.28	1.61
Q1812	0.65	0	2.28
Q1813	0.65	1.02	0.45
B1801	0	2.34	0
B1802	0	2.10	0.65
B1804	0	0.01	3.77
B1805	0	0	3.77

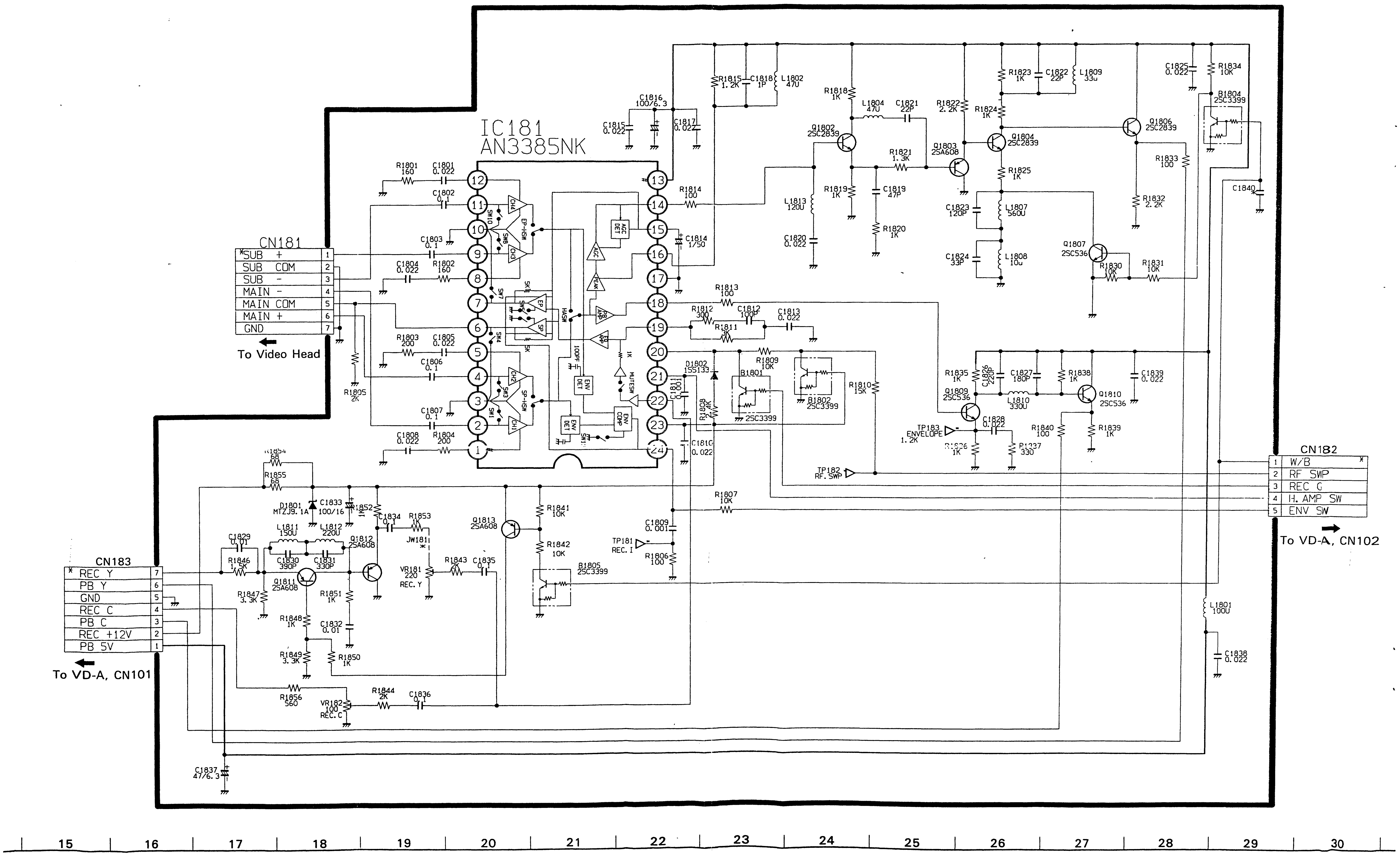
Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC181	1	1.62	2	0.69
	3	0	4	0.69
	5	1.60	6	0.01
	7	0.01	8	1.59
	9	0.68	10	0
	11	0.67	12	1.58
	13	4.75	14	2.56
	15	3.09	16	4.75
	17	0	18	2.91
	19	3.89	20	1.98
	21	0	22	0.19
	23	0.65	24	4.64

3-HOUR REC mode

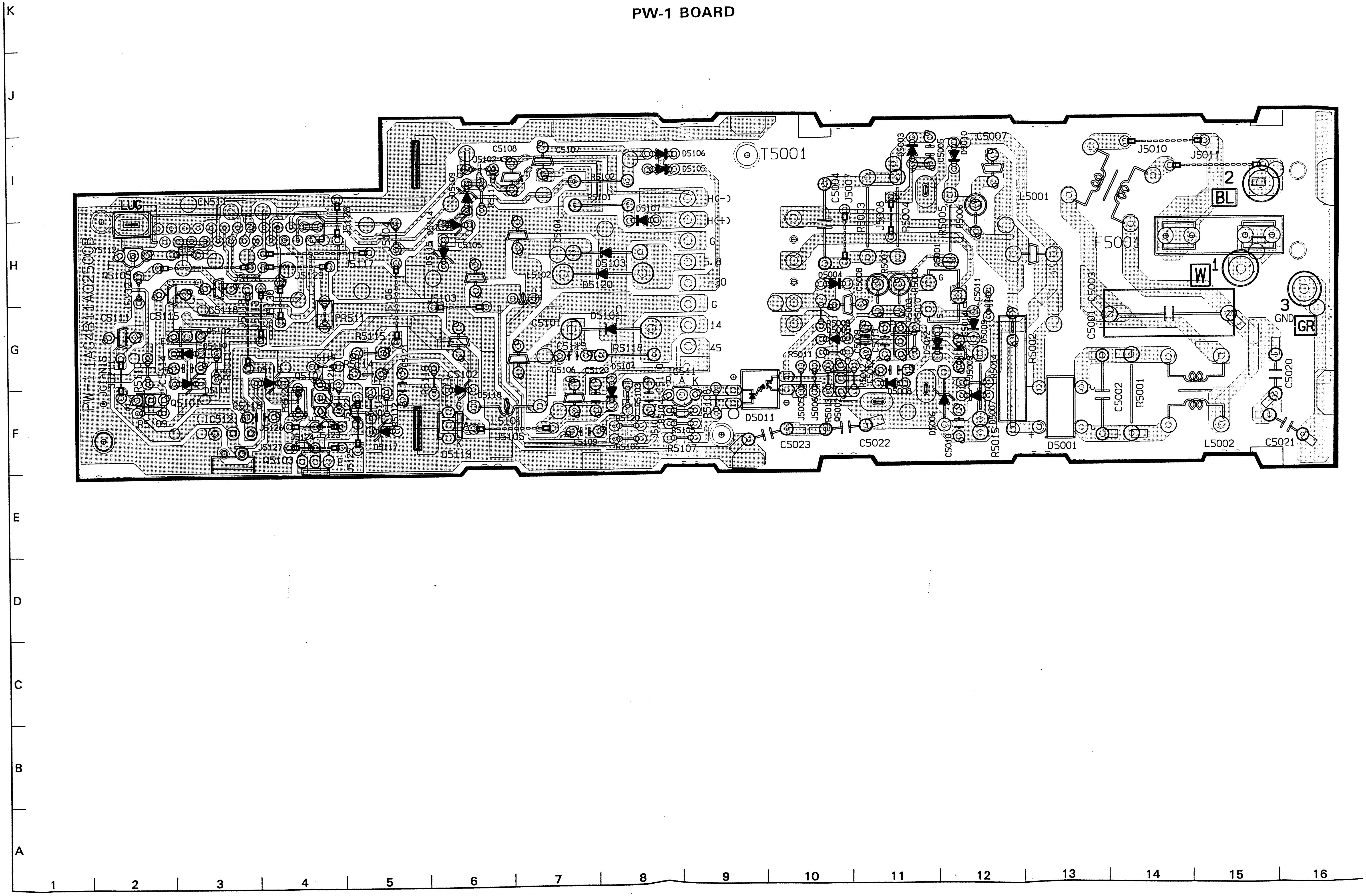
Location No.	E	C	B
Q1802	0	0.16	0
Q1803	0.16	0	0
Q1804	0	0.16	0.16
Q1806	0	0.16	0.16
Q1807	0	0	0
Q1809	0	0.16	0.01
Q1810	0	0.15	0.15
Q1811	2.62	2.39	7.11
Q1812	2.91	0	2.40
Q1813	9.29	9.27	8.60
B1801	0	7.05	0
B1802	0	0.01	9.28
B1804	0	0	3.79
B1805	0	0.02	3.79

Location No.	Pin No.	Volt (S)	Pin No.	Volt (S)
IC181	1	0.16	2	0.01
	3	0	4	0.01
	5	0.16	6	4.55
	7	0.74	8	0.16
	9	0.01	10	0
	11	0	12	0.15
	13	0.16	14	0
	15	4.84	16	0.16
	17	0	18	0
	19	4.54	20	7.03
	21	0	22	5.86
	23	9.26	24	4.02

VP-1 CIRCUIT

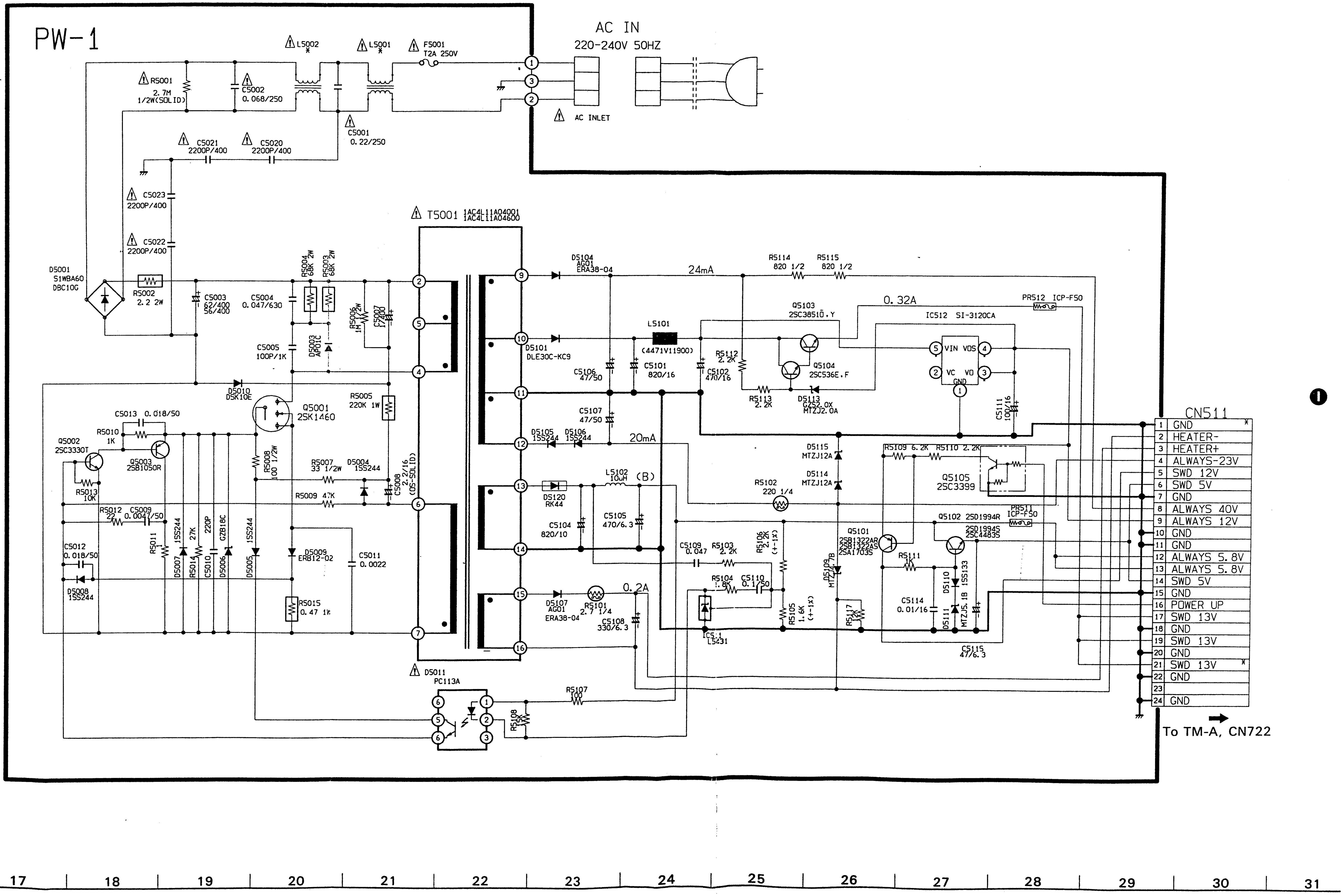

IC181
AN3385NK
CN181
SUB +
SUB COM
SUB -
MAIN -
MAIN COM
MAIN +
GND
To Video Head
CN182
W/B
RF SWP
REC C
H. AMP SW
ENV SW
To VD-A, CN102
CN183
REC Y
PB Y
GND
REC C
PB C
REC +12V
PB 5V
To VD-A, CN101
R1801 160
C1801 0.022
C1802 0.1
C1803 0.1
C1804 0.022
R1802 160
R1803 200
C1805 0.022
C1806 0.1
C1807 0.1
C1808 0.022
R1804 200
R1805 2K
C1815 0.022
C1816 100/6.3
C1817 0.022
R1814 100
C1814 1/50
R1813 100
R1812 300
C1812 100P
C1813 0.022
R1811 3K
R1809 10K
D1802 1SS133
C1811 0.001
R1808 2.4K
B1801 2SC3399
B1802 2SC3399
R1810 15K
C1810 0.022
R1807 10K
C1809 0.001
TP181 REC. I
R1806 100
TP182 RF. SWP
R1815 1.2K
C1818 1P
L1802 47U
R1818 1K
L1804 47U
C1821 22P
Q1802 2SC2839
R1821 1.3K
Q1803 2SA608
R1819 1K
C1819 47P
R1820 1K
L1813 120U
C1820 0.022
R1822 2.2K
R1823 1K
C1822 22P
L1809 33u
R1824 1K
Q1804 2SC2839
R1825 1K
C1823 120P
L1807 560U
C1824 33P
L1808 10u
Q1806 2SC2839
R1833 100
R1832 2.2K
Q1807 2SC536
R1830 10K
R1831 10K
C1825 0.022
R1834 10K
B1804 2SC3399
C1840
R1835 1K
C1826 220P
C1827 180P
R1838 1K
C1839 0.022
Q1809 2SC536
L1810 330U
Q1810 2SC536
C1828 0.022
TP183 ENVELOPE 1.2K
R1836 1K
R1837 330
R1840 100
R1839 1K
L1801 100U
C1838 0.022
R1854 68
R1855 68
D1801 MTZJ9.1A
C1833 100/16
R1852 1K
C1834 0.1
R1853 1K
JW181
Q1813 2SA608
R1841 10K
R1842 10K
B1805 2SC3399
C1829 0.01
L1811 150U
L1812 220U
Q1812 2SA608
R1846 1.5K
C1830 390P
C1831 330P
Q1811 2SA608
R1847 3.3K
R1851 1K
VR181 220 REC. Y
R1843 2K
C1835 0.1
R1848 1K
C1832 0.01
R1849 3.3K
R1850 1K
R1856 560
VR182 100 REC. C
R1844 2K
C1836 0.1
C1837 47/6.3
AGC
AGC DET
PEAK
PB AMP
REC AMP
MUTESW
ENV DET
ENV COMP
HASW
100PF
EP-HSW
SP-HSW
EP
SP
CH1
CH2
CH3
CH4
SW1
SW3
SW4
SW7
SW8
SW10
SW11
5K
1K
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

PW-1 BOARD



K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
LUG
CN511
PW-1 1AG4B11A02500B
T5001
H(-)
H(+)
G
5.8
-30
G
14
45
D5106
D5105
D5107
D5103
D5120
D5101
C5108
C5107
R5102
R5101
C5104
C5105
L5102
C5101
C5119
R5118
C5106
C5120
D5104
C5110
IC511
R A K
R5108
D5011
C5023
C5022
C5007
L5001
J5010
J5011
2
BL
F5001
W
1
3
GND
GR
C5001
C5003
C5002
R5001
R5002
D5001
L5002
C5020
C5021
C5004
J5007
R5003
J5008
R5004
R5005
R5006
D5004
C5008
R5007
R5008
C5011
D5008
D5012
R5014
R5015
J5005
J5006
R5011
Q5102
Q5105
Q5104
Q5101
Q5103
Y5112
J5132
C5111
C5115
C5118
C5114
C5116
IC512
R5109
D5110
D5111
D5113
D5117
D5118
D5119
J5117
J5129
J5131
J5103
J5105
J5106
J5126
J5127
J5124
J5123
J5128
J5102
PR511
R5115
R5119
C5102
L5101
C5109
R5120
R5106
R5107
R5105
R5103

PW-1 CIRCUIT


PW-1
AC IN
220-240V 50HZ
AC INLET
L5002
L5001
F5001
T2A 250V
R5001
2.7M
1/2W(SOLID)
C5002
0.068/250
C5001
0.22/250
C5021
2200P/400
C5020
2200P/400
C5023
2200P/400
C5022
2200P/400
D5001
S1WBA60
DBC10G
R5002
2.2 2W
C5003
62/400
56/400
C5004
0.047/630
R5004
68K 2W
R5003
68K 2W
R5006
1M 1/2W
C5007
1/400
C5005
100P/1K
D5003
AP01C
T5001 1AC4L11A04001
1AC4L11A04600
D5010
D5K10E
Q5001
2SK1460
R5005
220K 1W
C5013 0.018/50
R5010
1K
Q5002
2SC3330T
Q5003
2SB1050R
R5013
10K
R5007
33 1/2W
D5004
1SS244
R5008
100 1/2W
C5008
2.2/16
(OS-SOLID)
R5009 47K
R5012
22
C5009
0.0047/50
C5012
0.018/50
R5011
1SS244
D5007
27K
R5014
220P
C5010
GZB18C
D5006
1SS244
D5005
D5009
ERB12-02
C5011
0.0022
D5008
1SS244
R5015
0.47 1W
D5011
PC113A
D5104
AG01
ERA38-04
24mA
R5114
820 1/2
R5115
820 1/2
D5101
DLE30C-KC9
L5101
(4471V11900)
C5106
47/50
C5101
820/16
C5102
470/16
R5112
2.2K
Q5103
2SC3851O.Y
Q5104
2SC536E.F
0.32A
IC512 SI-3120CA
VIN VOS
VC VO
GND
PR512 ICP-F50
R5113
2.2K
D5113
GZS2.0X
MTZJ2.0A
C5111
100/16
C5107
47/50
D5105
1SS244
D5106
1SS244
20mA
D5115
MTZJ12A
D5114
MTZJ12A
R5109 6.2K
R5110 2.2K
Q5105
2SC3399
R5102
220 1/4
L5102
10uH
(B)
D5120
RK44
C5104
820/10
C5105
470/6.3
PR511
ICP-F50
Q5102 2SD1994R
2SD1994S
2SC4483S
Q5101
2SB1322AR
2SB1322AS
2SA1703S
C5109
0.047
R5103
2.2K
R5106
2.2K
(+-1%)
D5109
MTZJ4.7B
R5111
1K
D5110
1SS133
C5114
0.01/16
R5104
1.8K
C5110
0.1/50
R5105
1.6K
(+-1%)
R5117
1K
D5111
MTZJ5.1B
D5107
AG01
ERA38-04
R5101
2.7 1/4
0.2A
C5108
330/6.3
IC5.1
L5431
C5115
47/6.3
R5107
100
R5108
1K
CN511
1 GND
2 HEATER-
3 HEATER+
4 ALWAYS-23V
5 SWD 12V
6 SWD 5V
7 GND
8 ALWAYS 40V
9 ALWAYS 12V
10 GND
11 GND
12 ALWAYS 5.8V
13 ALWAYS 5.8V
14 SWD 5V
15 GND
16 POWER UP
17 SWD 13V
18 GND
19 SWD 13V
20 GND
21 SWD 13V
22 GND
23
24 GND
To TM-A, CN722
I
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

V23951

FILE No.

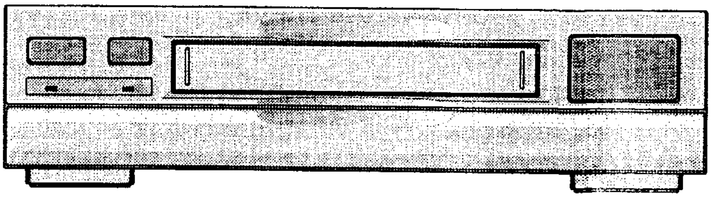
SANYO

SERVICE MANUAL

Time Lapse Video Cassette Recorder

TLS-2100P

(General Europe)



VHS PAL

CONTENTS

MAINTENANCE TABLE ON THE MONITOR SCREEN ········· 2
1. DISASSEMBLY ·· 3
2. ELECTRICAL ADJUSTMENT ···························· 4
3. TEST POINTS FOR TAPE PATH ADJUSTMENT ······ 10
4. PARTS LIST
  ACCESSORIES ·· 12
  PACKING & MATERIALS ································· 12
  CABINET & CHASSIS PARTS ·························· 12
  MECHANISM PARTS ····································· 13
  ELECTRICAL PARTS ····································· 16
CIRCUIT DIAGRAMS (Refer to the separate volume)

Please see other materials with Reference number given in table below.

Materials	Model No.	Reference No.
VCR Mechanism Adjustment	TLS-2000P	WM-550197

PRODUCT SAFETY NOTICE

The components designated by a symbol (⚠) in this schematic diagram designates components whose value are of special significance to product safety. Should any component designated by a symbol need to be replaced, use only the part designated in the Parts List. Do not deviate from the resistance, wattage, and voltage ratings shown.

NOTE: 1. Parts order must contain model number, part number, and description.
2. Substitute parts maybe supplied as the service parts.
3. N.S.P.: Not available as service parts.

Design and specifications are subject to change without notice.

FE4Q/EX 175 800 85

REFERENCE No. SM1541117

MAINTENANCE TABLE ON THE MONITOR SCREEN

To display the maintenance table, press "MENU" key with "▼" key while the fourth MENU 〈ALARM TIME〉 is isplayed.

ALARM TIME → Press "MENU" key with "▼" key → Maintenance table 1 → "MENU" key → Maintenance table 2 → "MENU" key → Normal screen

Maintenance table 1

The used time of each mode (part) is displayed, and can be reset by items.
Access the maintenance-screen according to the above, and then Fig. below is displayed and HEAD TIME will blink. Move the blinking to the item to be reset with "⬇" key and press the "MENU RESET" key, and then the used time for the item will be reset (00000H).

```
        MAINTENANCE TABLE 1
〈USED TIME〉
HEAD                00000H
POWER ON            00000H
ALARM               00000H
```

HEAD :	Used time of the video head (cylinder) total hours of 〈MH-ON〉 (SSB BLK2 D4) = "L" Note : Reset when the cylinder is replaced.
POWER ON :	Hours of the power supply being ON 〈POWER ON〉 〈SSB BLK1 D7〉 = "L"
ALARM :	Number of ALARM REC. Total counts of ALARM.

Note : The data for the maintenance tables are memoried in E^2 PROM, and the memory can be kept if the timer microcomputer is reset.

Maintenance table 2

As shown in Fig. below Maintenance Table 2, 〈ERROR〉 is displayed on the screen.

```
        MAINTENANCE TABLE 2
〈ERROR〉
1   12/25/95/   E1   01
2   --/--/--/   --   --
3   --/--/--/   --   --
4   --/--/--/   --   --
5   --/--/--/   --   --
6   --/--/--/   --   --
7   --/--/--/   --   --
8   --/--/--/   --   --
```

When the "MENU RESET" key is pressed during display and resetting all data.

〈ERROR〉 : Dates and error codes are displayed when VCR happens to be in an abnormal condition and the system is down.
The newest data is displayed in the first line, and the old ones are moved down one by one.
Not-displayed old data is cleared automatically.

Error Codes (Self-Diagnosis Contents)

E 1 → The cylinder motor does not rotate.

E 2 → The take-up reel does not rotate.

E 3 → The capstan motor does not rotate.

E 4 → The tape cannot be loaded with the cassette inserted. (But unloading can be performed.)

E 5 → The loading and unloading cannot be performed with the cassette inserted. (The tape guide is caught.)

E 6 → Front unloading cannot be performed when ejecting the cassette. (Front loading can be performed.)

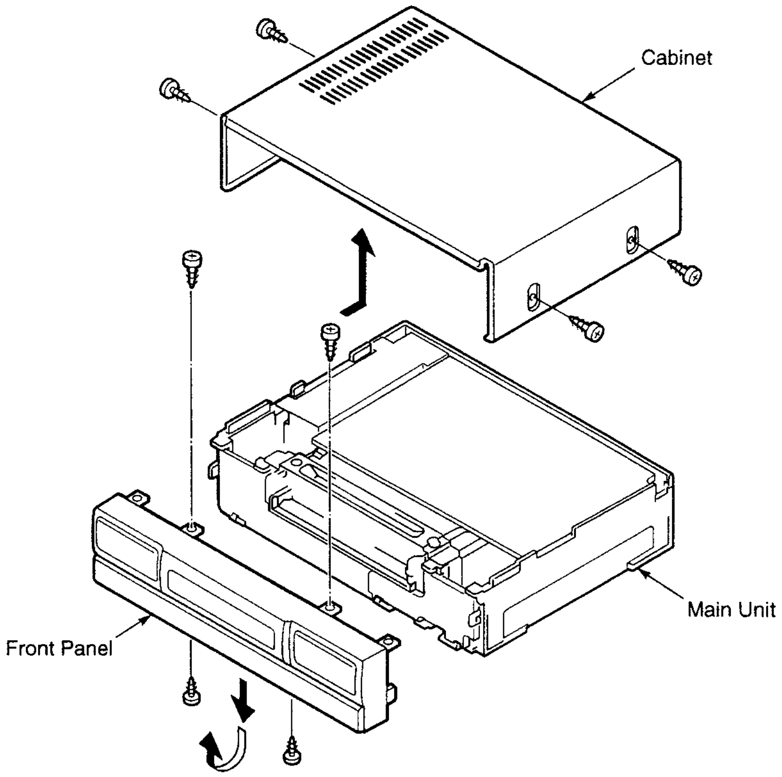
E 7 → Front loading and front unloading cannot be performed when ejecting the cassette.

E 8 → The mechanism becomes 1 (BRAKE) while moving from 2 (STOP), 3(PLAY), 4(STILL/SLOW), and to 5 (REVERSE FRAME ADVANCE). (The mechanism mode switch contact is faulty.)

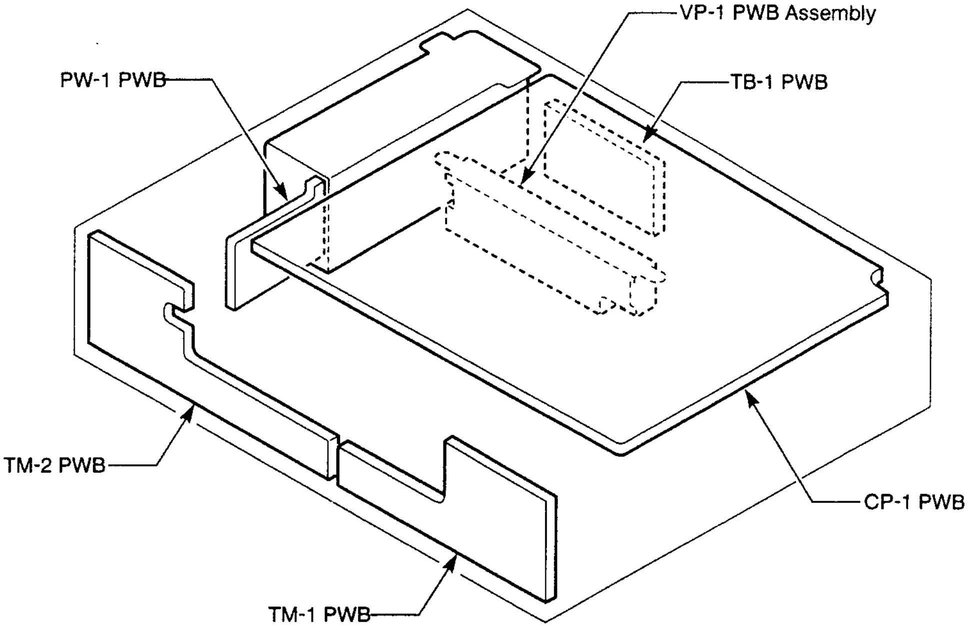
E 9 → The mechanism becomes 7 (INITIAL) while moving from 1 (BRAKE), 2(STOP), 3(PLAY), 4(STILL/SLOW), and to 5 (REVERSE FRAME ADVANCE). (The mechanism mode switch contact is faulty.)

1. DISASSEMBLY

1-1. REMOVAL OF CABINET


Cabinet
Main Unit
Front Panel

1-2. CIRCUIT BOARD LOCATIONS


VP-1 PWB Assembly
PW-1 PWB
TB-1 PWB
TM-2 PWB
CP-1 PWB
TM-1 PWB

2. ELECTRICAL ADJUSTMENT

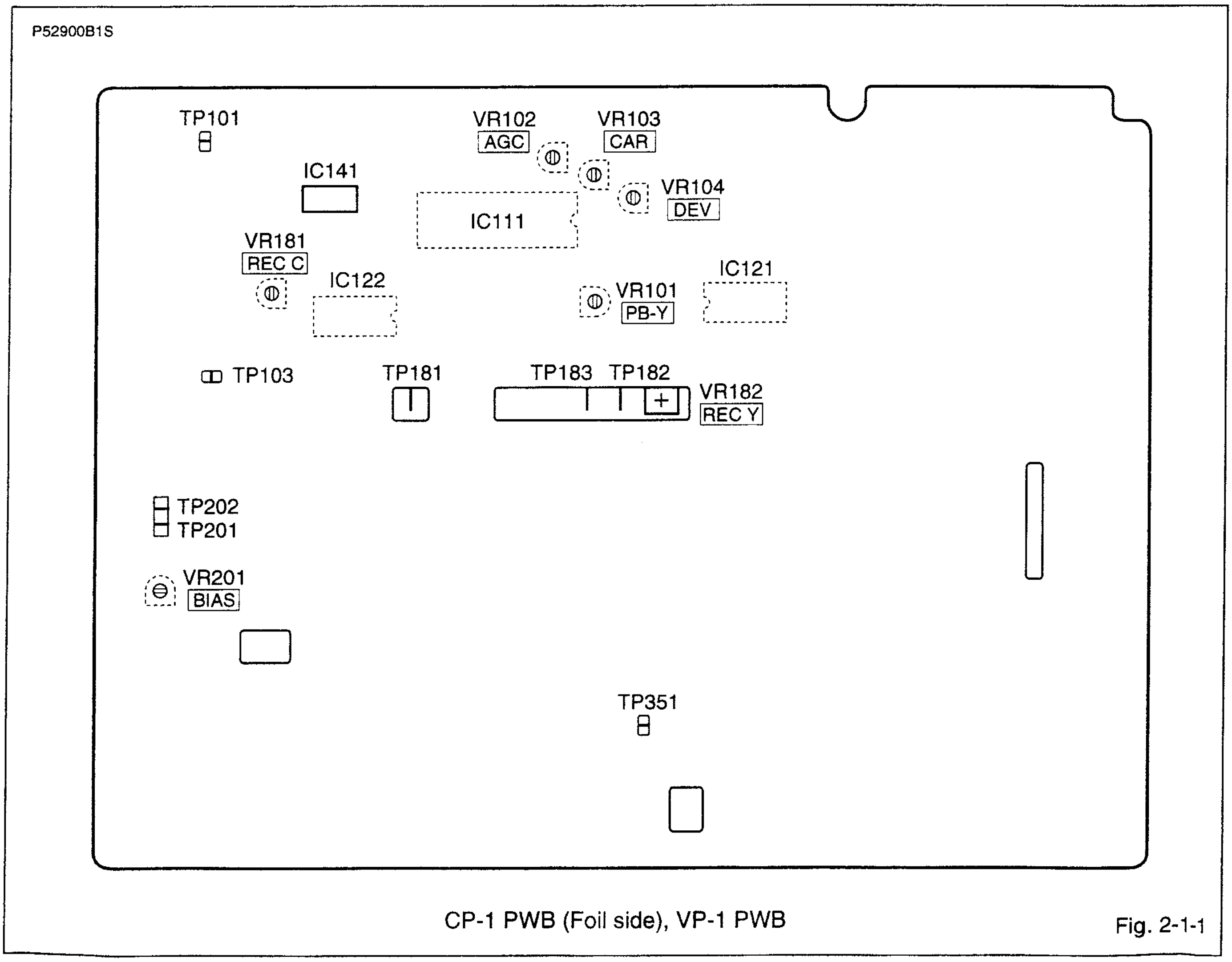
2-1. SERVO CIRCUIT ADJUSTMENT

- These adjustments should be carried out upon completion of the tape transport adjustments.
- If the tape transport abjustments (except thetilt abjustment) are done after these abjustments, follow the procedures again in section 2-1-3. "switching position adj."
- When a cassette tape is loaded, auto-tracking will be set immediately after starting the first playback. As this will deviate the tracking center set, be sure to press tracking buttons (+) or (–) once directly after starting playback to prevent auto-tracking from being set.

2-1-1. TEST EQUIPMENT AND STANDARDS REQUIRED

Color Bar Signal Generator	PAL color bar signal with 100% white level (EBU color bar signal)
Oscilloscope	Vertical sensitivity : 5 mV/DIV, external trigger Band width : more than 10 MHz
Alignment Tape	VHJ-0009 or VHJ-0023 : SP mode, monoscope, 6 kHz
Blank Tape	VHS-type cassette tape
Monitor TV	

2-1-2. LOCATION OF ADJUSTMENT POINTS


P52900B1S
TP101
VR102
AGC
VR103
CAR
IC141
VR104
DEV
IC111
VR181
REC C
IC122
IC121
VR101
PB-Y
TP103
TP181
TP183
TP182
VR182
REC Y
TP202
TP201
VR201
BIAS
TP351

CP-1 PWB (Foil side), VP-1 PWB

Fig. 2-1-1

NOTES :

- Set the REC/PLAY SPEED button to indicator panel to the 3H (3 hours) mode.
- Self-recoding means "Record any broadcasting or video signal and play back the just-recorded portion"

2-1-3. SWITCHING POSITION ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT) TP183 (SW-P)	Oscilloscope	PLAY(3H)mode Alignment tape VHJ-0009 or VHJ-0023

Adj. Condition	Adj. Condition
REC button TRACKING (+, –) button EJECT button	6.5 H ± 0.5 H

1. Play back the alignment tape, and set the tracking control position to the center by pressing TRACKING buttons (+) and (–) simultaneously.
2. Press the REC button three times within 10 seconds after the display is shown. All three presses must be carried out within 2 seconds. For the third time, press the REC button more than 0.5 seconds as shown in Fig. 2-1-3.
3. The automatic adjustment mode is set, the numerals of Indicator display "P:00:00" chages automatically and the unit stops at the point the adjustment value becomes approx. 6.5 H.
4. In the same abjustment mode, trigger at the rising edge of the RF SW pulse, and check that the front edge of the V sync signal from the rising edge of the RF SW pulse is delayed by 6.5H ± 0.5H as shown in Fig. 2-1-4. If it is not 6.5H±0.5H, manually perform fine ajdustments for the TRACKING buttons (+) or (–) to satisfy the specification.
5. After completing adjustments, press the EJECT button (more than 1 second) and check the Indicator shows "P– : –" at this time.

NOTE : Repeat steps 1 to 4 if the adjustment takes more then 10 seconds.

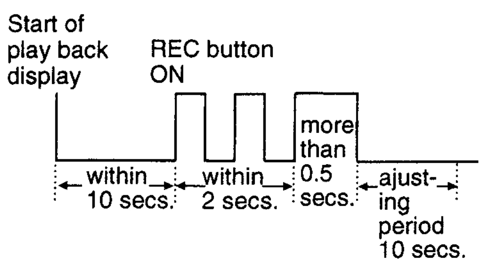


Fig. 2-1-2

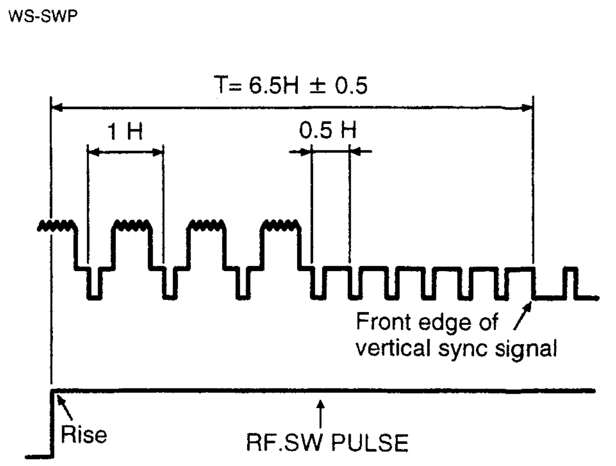


Fig. 2-1-3

2-1-4. STILL V-LOCK ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
Picture of monitor TV	Color bar generator	Self-recording (3H mode) STILL mode Blank tape

Adj. Location	Adj. Value
TRACKING (+) button TRACKING (–) button	The minimum vertical shake

1. Set the REC/PLAY SPEED button to the 3H (3 hours) mode.
2. Play back the just-recorded portion and then set the VCR in the STILL mode.
3. Press the TRACKING (+) button or the TRACKING (–) button so that vertical shake of the picture is brought to its minimum.

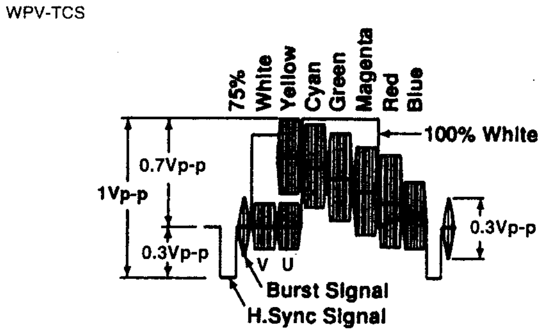
2-2. VIDEO CIRCUIT ADJUSTMENT

Before making the following adjustments, complete the adjustments described in section 2-1. "Servo Circuit."

2-2-1. TEST EQUIPMENT AND STANDARDS REQUIRED

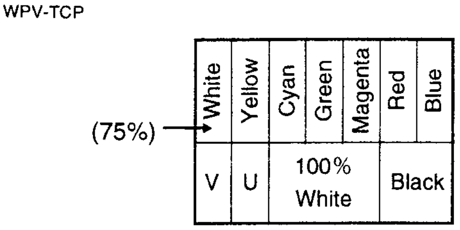
Color Bar Signal Generator	PAL color bar signal with 100% white level (EBU color bar signal)
Frequency Counter	Input frequency : 20 Hz~10 MHz
Oscilloscope	Vertical sensitivity : 5 mV/DIV, external trigger Bandwidth : more than 10 MHz
Oscilloscope Probe	Input capacity : less than 25 pF (10:1) less than 40 pF (1:1) Covering frequency : DC~40 MHz (10:1) DC~30 MHz (10:1)
Alignment Tape	VHJ-0008 or VHJ-0023 : SP mode, color bar, 1 kHz (Color bar signal waveform is described below. Refer to Fig. 2-2-1.)
Blank Tape	VHS-type cassette tape
Alignment Relay Jig	VHJ-0066 : 7-wire flat cable for VP-1 PWB assembly

ALIGNMENT TAPE COLOR BAR SIGNAL


WPV-TCS
75%
White
Yellow
Cyan
Green
Magenta
Red
Blue
100% White
0.7Vp-p
1Vp-p
0.3Vp-p
0.3Vp-p
V U
Burst Signal
H.Sync Signal

Color bar signal waveform (VHJ-0008)

Fig. 2-2-1


WPV-TCP
(75%)
White
Yellow
Cyan
Green
Magenta
Red
Blue
V
U
100% White
Black

Color bar pattern (VHJ-0008) on monitor TV

Fig. 2-2-2

ADJUSTMENT RELAY JIG

Connect the flat cable end from the cylinder assembly to the VP-1 PWB assmbly using the relay jig to provide simple repairing or adjustment of the VP-1 PWB assembly, as shown in Fig. 2-2-3. Further, when adjusting the VP-1 PWB assembly, be sure to make contact an end of shield case with bracket of the VP-1 PWB assembly to maintain the shield effect. If the VP-1 PWB assembly does not contact, there is insufficient ground and no proper play back image can be obtained.

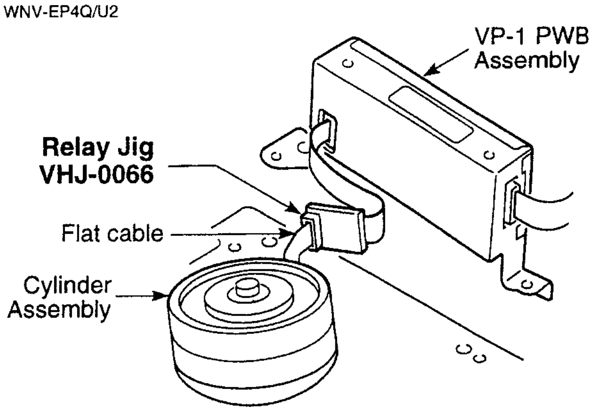
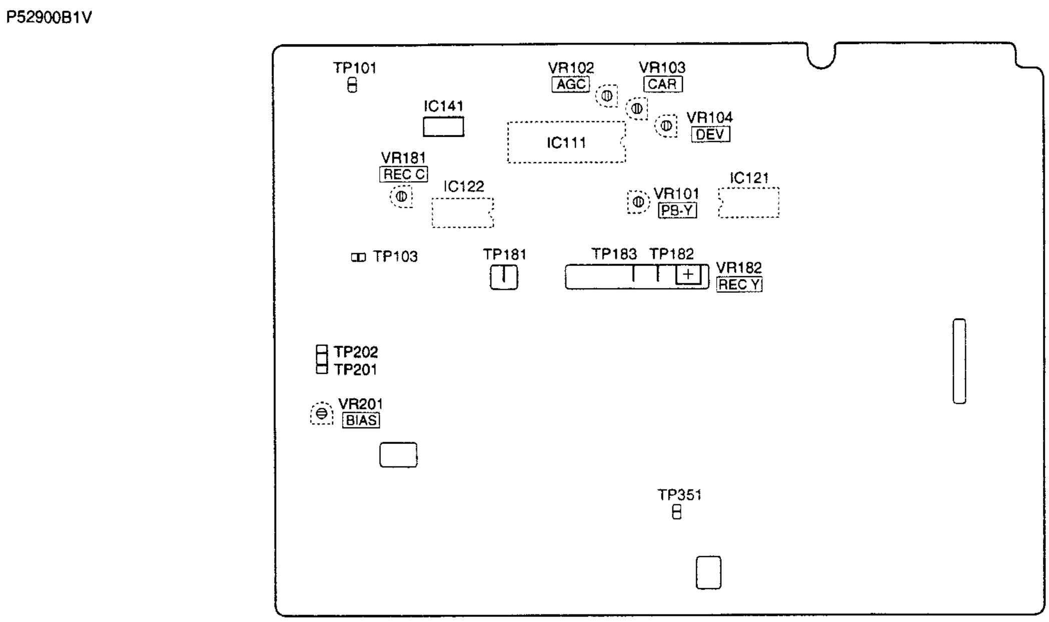

WNV-EP4Q/U2
VP-1 PWB Assembly
Relay Jig VHJ-0066
Flat cable
Cylinder Assembly

Fig. 2-2-3

2-2-2. LOCATION OF TEST POINTS


P52900B1V
TP101
VR102
AGC
VR103
CAR
IC141
VR104
DEV
IC111
VR181
REC C
IC122
IC121
VR101
PB-Y
TP103
TP181
TP183
TP182
VR182
REC Y
TP202
TP201
VR201
BIAS
TP351

CP-1 PWB (Foil side), VP-1 PWB

Fig. 2-2-4

NOTE:

Self-recording weans "Record the video signal and play back the just-recorded portion."

2-2-3. AGC LEVEL ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT)	Color bar generator Oscilloscope (10:1 probe)	E-E mode

Adj. Location	Adj. Value
VR102 (AGC)	1 Vp-p ± 0.03 Vp-p

1. Terminate TP101 and ground with a 75Ω resistor, and connect the color bar generator to the VIDEO IN terminal.
2. Adjust VR102 (AGC) for 1 Vp-p ± 0.03 Vp-p as shown in Fig. 2-2-5.

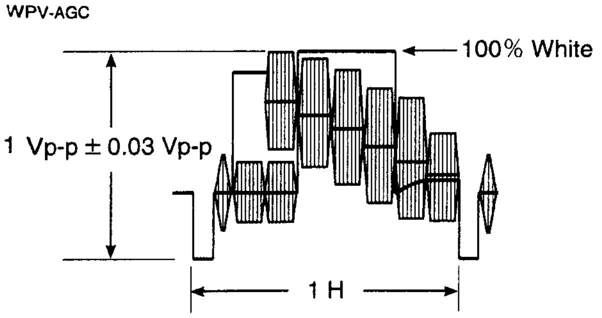

WPV-AGC
100% White
1 Vp-p ± 0.03 Vp-p
1 H

Fig. 2-2-5

2-2-4. PB-Y LEVEL ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT)	Oscilloscope	PLAY(2H)mode Alignment tape VHJ-0008 or VHJ-0023

Adj. Location	Adj. Value
VR101 (PB-Y)	1 Vp-p ± 0.03 Vp-p

1. Terminate TP101 and ground with a 75Ω resistor.
2. Play back Alignment tape in 3H mode.
3. Adjust VR101 (PB-Y) for the video luminance signal level of 1 Vp-p ± 0.03 Vp-p. (Refer to Fig. 2-2-6)

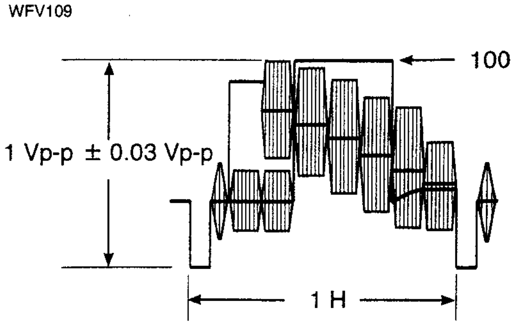

WFV109
100% White
1 Vp-p ± 0.03 Vp-p
1 H

Fig. 2-2-6

2-2-5. CARRIER SET ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP112	Color bar generator Frequency counter	REC (3H) mode

Adj. Location	Adj. Value
VR103 (CAR)	4 MHz ± 0.03 MHz

1. Connect the color bar generator to the VIDEO IN terminal.
2. After removing the first color bar signal input from the VIDEO IN terminal, immediately adjust VR103 (CAR) so that the frequency becomes 4 MHz ± 0.03 MHz.

2-2-6. DEVIATION ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP101 (VIDEO OUT)	Color bar generator Oscilloscope	Self-recording (3H) mode Blank tape

Adj. Location	Adj. Value
VR104 (DEV)	1 Vp-p ± 0.05 Vp-p

1. Record the color bar signal on the blank tape.
2. Play back of the just-recorded portion.
3. Adjust VR104 (DEV) for 1 Vp-p ± 0.05 Vp-p as shown in Fig. 2-2-8.
4. If the adjustment value is not satisfactory, adjust VR104 (DEV) and repeat steps 1 to 3.

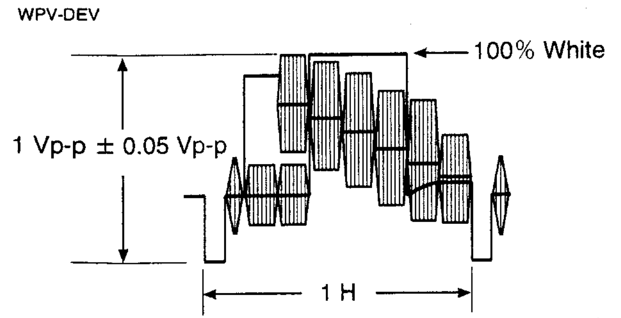


Fig. 2-2-7

2-2-7. C REC CURRENT ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP181 (on VP-1 PWB)	Color bar generator Oscilloscope (1:1 probe)	REC (3H) mode Blank tape

Adj. Location	Adj. Value
VR181 (REC-C, CP-1)	130 mVp-p ± 5 mVp-p

1. Connect the ground of the oscilloscope to the shield case of the VP-1 PWB assembly.
2. Adjust VR 182 so that the video luminance signal level is ZERO.
3. Connect the color bar generator to the VIDEO IN terminal.
4. Adjust VR182(REC-C) so that the video luminance signal level is 130 mVp-p ± 5 mVp-p.(Refer to Fig.2-2-8)

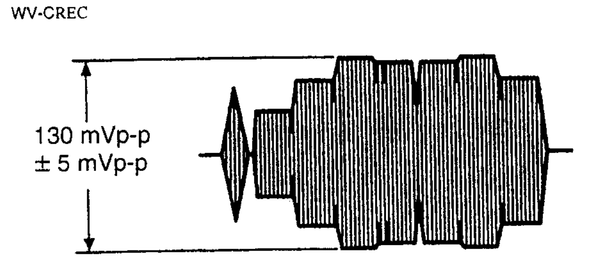


Fig. 2-2-8

2-2-8. Y REC CURRENT ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP181 (on VP-1 PWB)	Color bar generator Oscilloscope (1:1 probe)	REC (3H) mode Blank tape

Adj. Location	Adj. Value
VR182 (REC-Y)	480 mVp-p ± 5 mVp-p

1. Connect the ground of the oscilloscope to the shield case of the VP-1 PWB assembly.
2. Connect the color bar generator to the VIDEO IN terminal.
3. Adjust VR182(REC-Y) so that the video luminance signal level is 480 mVp-p ± 5 mVp-p.(Refer to Fig.2-2-9)

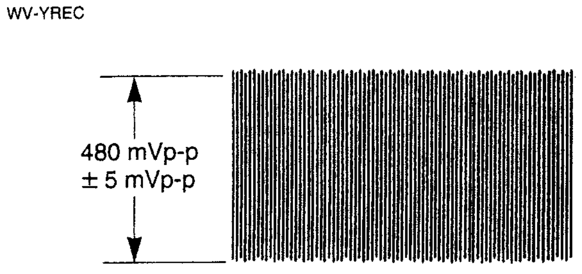


Fig. 2-2-9

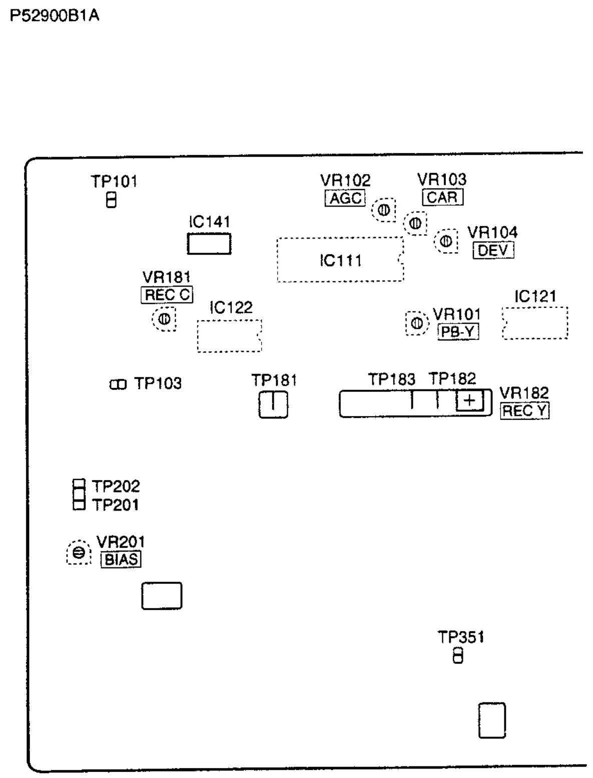
2-3. AUDIO CIRCUIT ADJUSTMENT

- Before making these adjustments, be sure to make the adjustments described in the tape path adjustment, especially the ACE heads adjustments (refer to the separate volume "TLS-2000 VCR Mechanism Adjustment") so that the tape traveling between the supply side guide roller and loading guide post runs without fluttering or curling.
- Before making these adjustments, (except the ACE heads adjustments), be sure to make the adjustments described in section 2-1. "Servo Circuit." and section 2-2. "Video Circuit."

2-3-1. TEST EQUIPMENT AND STANDARDS REQUIRED

Color Bar Signal Generator	PAL color bar signal with 100% white level (EBU color bar signal)
Oscilloscope	Vertical sensitivity : 5 mV/DIV Bandwidth : more than 30 MHz
AC Voltmeter	Effective value indication Input frequency : 10 Hz~20 kHz Input impedance : more than 1 MΩ Measurement level : 1 mV (full scale)
Frequency Counter	Input frequency : 20 Hz~10 MHz
Blank Tape	VHS-type cassette tape

2-3-2. LOCATION OF ADJUSTMENT POINTS



CP-1 PWB (Foil side)

Fig. 2-3-1

NOTE :

- Set the following switch to the positions indicator below, before making following adjustments.

SWITCH	POSITION
REC/PLAY SPEED	3 H

2-3-3. BIAS LEVEL ADJ.

Measuring Point	Measuring Equipment	Adj. Condition
TP201 (HOT) TP202 (COLD)	Color bar generator Oscilloscope AC voltmeter Frequency counter	REC mode Blank tape

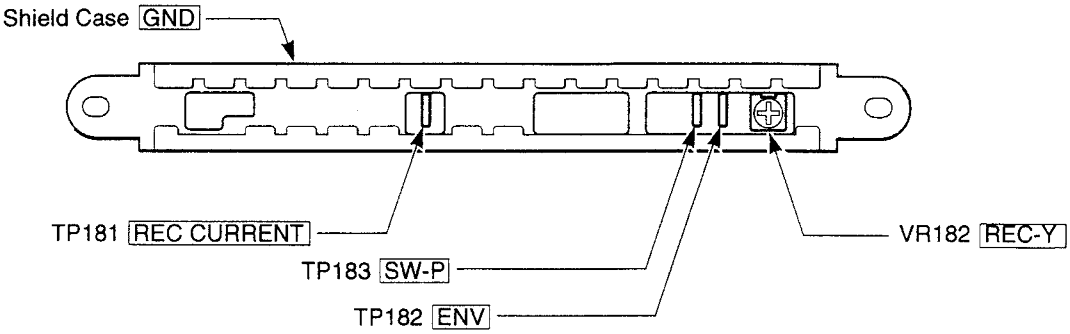
Adj. Location	Adj. Value
VR201 (BIAS)	21 mVrms

1. Connect the color bar generator to the VIDEO IN terminal.
2. Load the VCR with a blank tape and select the record mode without all incoming signal.
3. After confirming on the oscilloscope that a 70kHz ± 5 kHz sine wave is being output, adjust VR201 (BIAS) so that the AC voltmeter's reading is 21 mVrms.

3. TEST POINTS FOR TAPE PATH ADJUSTMENT

Test points TP182 (ENV) and TP183 (SW-P) for tape path adjustment are shown in figure below.
For adjustment, refet to the separate volume "TLS-2000 VCR Mechanism Adjustment" (WM-550197).

P08800C1T


Shield Case GND
TP181 REC CURRENT
TP183 SW-P
TP182 ENV
VR182 REC-Y

VP-1 PWB Assembly

Fig. 3-1

4. PARTS LIST

ACCESSŌRIES

LOCATION	PARTS NO.	DESCRIPTION
	613 170 4886	INSTRUCTION MANUAL
⚠	613 095 0550	CORD,POWER
OR ⚠	613 133 2393	CORD,POWER
OR ⚠	645 002 6805	CORD,POWER
OR ⚠	645 003 3766	CORD,POWER
OR ⚠	645 009 0400	CORD,POWER

****

PACKING MATERIALS

LOCATION	PARTS NO.	DESCRIPTION
	613 170 5609	CARTON CASE
	613 170 5630	CUSHION,FRONT
	613 170 5647	CUSHION,BACK
	613 139 3745	POLYE COVER,INNER

CABINET & CHASSIS PARTS

LOCATION	PARTS NO.	DESCRIPTION
CH-1	411 137 0007	SCR L-TPG BIN 3X10
CH-2	613 170 4190	COMPL,PWB VP-1
CH-3	613 170 4671	COMPL,PWB PW-1
CH-5	411 021 7907	SCR S-TPG BIN 4X12
CH-6	411 021 6405	SCR S-TPG BIN 3X8
CH-7	613 122 3127	HOLDER,PCB
CH-8	613 161 2389	TERMINAL
CH-9	613 113 7516	INSULATOR
CH-10	411 021 3800	SCR S-TPG BIN 3X10
CH-11	613 134 0848	COVER,TOP
CH-12	412 028 9406	SPECIAL SCREW
CH-15	613 170 6200	COMPL,PWB CP-1-A
CH-16	613 170 4206	COMPL,PWB TB-1
CH-18	613 053 8055	FIXER
CH-19	613 170 5210	COMPL,PWB TM-1
CH-20	613 170 5227	COMPL,PWB TM-2
CH-21	613 170 5272	ASSY,CABINET FRONT
CH-22	613 170 5326	ASSY,DOOR
CH-24	613 166 9925	SPRING
CH-25	613 170 5388	DOOR CASSETTE
CH-26	613 048 2884	LOCK
CH-28	613 132 3742	COVER,BOTTOM
CH-30	613 129 8699	STAND,BACK

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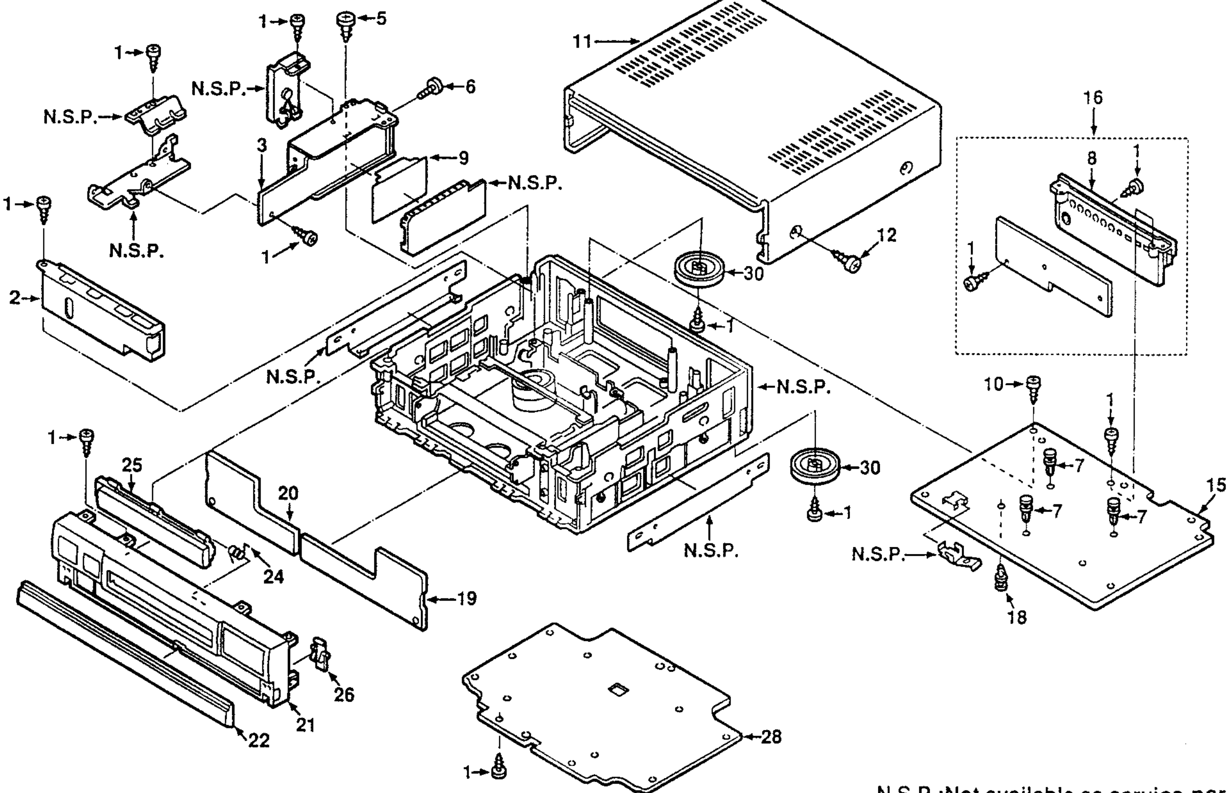


CH-FE4Q/EX

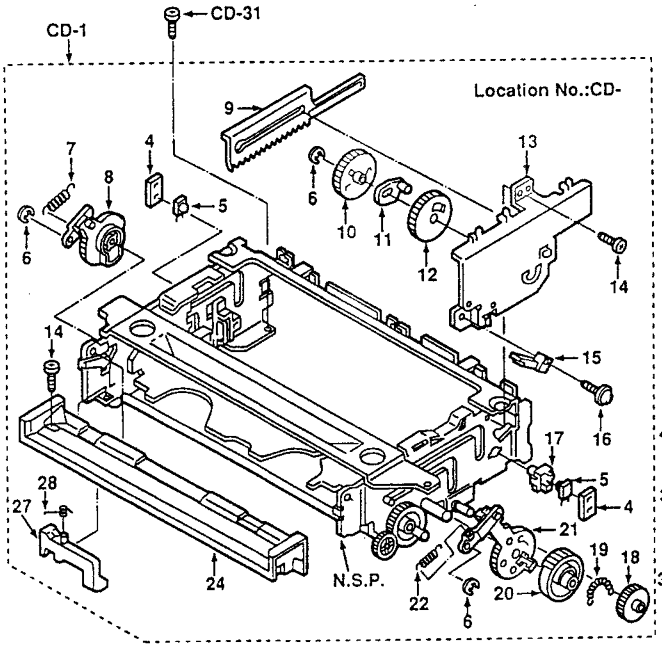
N.S.P.:Not available as service parts
FE4Q/EX

MECHANISM PARTS

MECHANISM PARTS 1

LOCATION	PARTS NO.	DESCRIPTION
CD-1	613 136 2253	COMPL,CASSETTE MECHANISM
CD-4	613 022 0585	LID
CD-5	407 098 3201	PHOTO COUPLE PN150SAN
CD-6	411 015 9801	RING E 2.3
CD-7	613 022 1643	SPRING,LINK L
CD-8	613 022 0073	ASSY,GEAR,LEVER L
CD-9	613 022 2695	RACK
CD-10	613 141 6109	GEAR,LOCK
CD-11	613 139 8962	ASSY,LEVER,PINION
CD-12	613 022 2626	GEAR,PINION
CD-13	613 021 9657	ASSY,BRACKET,GEAR
CD-14	411 027 1305	SCR S-TPG BIN 2.6X4
CD-15	613 095 0949	SW,SPECIAL
CD-16	411 106 9208	SCR PAN+SW+W 2X9
CD-17	613 022 0943	HOLDER,TRANSISTOR
CD-18	613 022 2619	GEAR,IDLER
CD-19	613 022 1667	SPRING,GEAR MAIN
CD-20	613 022 2596	GEAR,MAIN
CD-21	613 022 0097	ASSY,GEAR,LEVER R
CD-22	613 022 1674	SPRING,LINK R
CD-24	613 108 0256	BOARD,UNDER
CD-27	613 124 5006	LEVER,SAFETY SW
CD-28	613 125 6149	SPRING,SAFETY SW
CD-31	411 001 8702	SCR BIN 3X6
MA-1	613 102 9279	ASSY,LEVER,TENSION
MA-2	613 105 5698	SPRING,LEVER TENSION
MA-3	613 100 4573	ASSY,HOLDER,BAND
MA-4	411 130 5207	SCR PAN+FLG 2.6X2.4
MA-5	411 109 1605	WASHER Y 2.6X6X0.25
MA-6	613 150 2550	ASSY,REEL,SUPPLY
OR	613 093 3904	ASSY,REEL,SUPPLY
MA-7	613 139 7859	ASSY,REEL,TAKE UP
OR	613 093 3898	ASSY,REEL,TAKE UP
MA-8	412 021 5306	SPECIAL WASHER 3.1X6X0.3
OR	412 015 8900	SPECIAL WASHER 3.1X6X0.4
OR	412 015 8504	SPECIAL WASHER 3.1X6X0.5

LOCATION	PARTS NO.	DESCRIPTION
MA-9	411 109 1506	WASHER Y 2.1X6X0.25
OR	411 109 1407	WASHER Y 2.1X5X0.25
MA-10	613 100 4672	ASSY,GEAR,ONE WAY
MA-11	412 026 7305	SPECIAL WASHER 2.6X6X0.25
MA-12	613 103 2644	GEAR,REEL TAKE UP
MA-13	412 041 7205	WASHER 2.6X6X0.13
MA-15	412 042 4302	SPECIAL SCREW 2.6X4
MA-16	613 100 4696	COMPL,IDLER,CLUTCH
MA-17	411 120 1301	WASHER Y 2.1X4X0.25
MA-18	613 100 4689	ASSY,IDLER
MA-19	411 021 3107	SCR S-TPG BIN 2.6X8
MA-20	613 120 9053	COMPL PCB,MC-4
MA-21	407 016 7205	LED LN59
MA-22	613 100 4641	ASSY,SLIDE,ACT PLATE
MA-23	613 142 9086	SLIDE,C BRAKE
MA-24	613 022 1612	SPRING,RETURN SLIDE
MA-25	613 022 1506	SPRING,SUB T
MA-26	613 098 0106	ASSY,BRAKE SUB T
MA-27	613 103 2651	PULLEY,REEL
MA-28	613 022 1490	SPRING,SUB SUPPLY
MA-29	613 022 2374	SLIDE,ACT BRAKE
MA-30	613 084 8871	BRAKE,SUB SUPPLY
MA-31	613 100 4627	ASSY,SLIDE MAIN PLATE
MA-32	613 080 9216	ASSY,BRAKE,SUPPLY
MA-33	613 022 1544	SPRING,MAIN BRAKE
OR	613 086 2914	SPRING,MAIN BRAKE
MA-34	613 080 9209	ASSY,BRAKE,TAKE UP
MA-35	411 109 3005	WASHER Y 2.6X5X0.5
MA-36	613 022 2015	LEVER,CONT PLATE
MA-37	412 015 9501	SPECIAL WASHER
MA-38	411 021 7907	SCR S-TPG BIN 4X12
MA-39	412 045 4606	SPECIAL WASHER 2.4X6X0.25
MA-40	412 030 2402	SPECIAL SCREW
MA-41	412 015 9600	SPECIAL WASHER
MA-42	613 105 5728	SPRING,LEVER BRAKE
MA-43	613 100 7659	ASSY,LEVER,BRAKE BAND
MA-44	412 028 3008	SPECIAL WASHER 1.6X4X0.4T
MA-45	613 099 7432	LEVER,ONE WAY LOCK
MA-46	411 130 5009	WASHER Y 2.1X8X0.2



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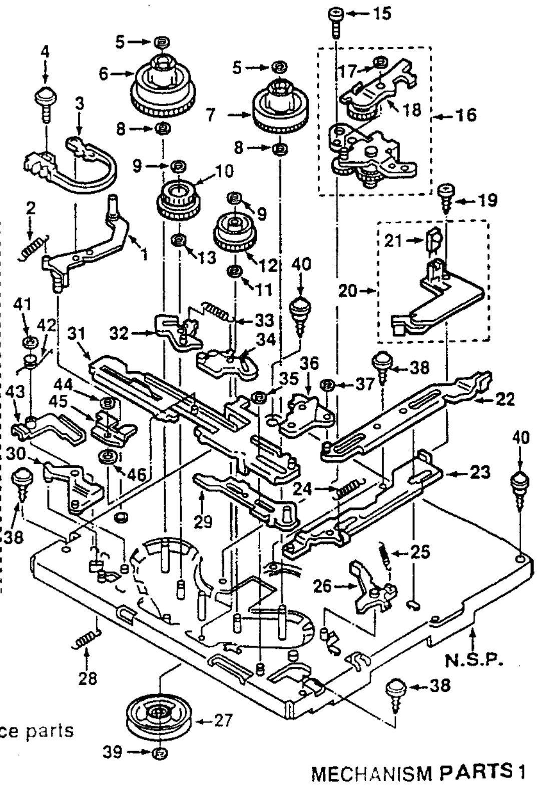

N.S.P.:Not available as service parts

MECHANISM PARTS 2

LOCATION	PARTS NO.	DESCRIPTION
DR-1	613 172 7960	COMPL.CYLINDER 2N4P-Q0
DR-2	411 038 1608	SCR PAN+W 3X8
DR-3	613 172 7984	ASSY.CYLINDER.UPR 2N4P-Q0
DR-4	613 078 8566	ASSY.CYLINDER.LWR 4
DR-5	613 097 2170	SPACER.MOTOR
DR-6	613 088 9072	BASE.CYLINDER
OR	613 022 1001	BASE.CYLINDER
DR-7	411 047 7509	SCR PAN+FLG 3X6
DR-8	411 047 5000	SCR PAN+FLG 2.6X8
OR	412 030 9708	SPECIAL SCREW 2.6X9
DR-9	613 085 7279	STATOR.MOTOR CYL
OR	613 132 3520	STATOR.MOTOR CYL
DR-10	411 044 8301	SCR PAN+SW 2.3X10
OR	411 044 9209	SCR PAN+SW 2.3X8
OR	412 036 4905	SPECIAL SCREW 2.3X10
DR-11	613 022 4019	ROTOR.MOTOR CYL
DR-12	411 044 9001	SCR PAN+SW 2.3X6
OR	412 036 5001	SPECIAL SCREW 2.3X6
MB-1	613 123 4802	SLEEVE
MB-2	613 053 3227	SPECIAL WASHER
MB-3	613 123 4970	TAPE GUIDE
MB-4	411 004 5302	NUT HEX 3
MB-5	613 123 9418	CAP
MB-6	613 152 8079	SLIDE.ACT PINCH
MB-7	613 021 9800	ASSY.LEVER.CAM PINCH
MB-8	411 109 2008	WASHER Y 3.1X8X0.5
MB-9	613 022 1797	SPRING.ACE HEAD
MB-10	613 021 9640	COMPL.BRACKET.HEAD
MB-11	613 110 1692	SLEEVE.ACE HEAD
MB-12	412 015 8207	SPECIAL NUT (M5)
MB-13	411 120 0007	SCR PAN+SW+W 2.6X5
MB-14	613 120 3631	BRACKET.STOPPER
MB-15	613 105 5711	SPRING.SLIDE BRAKE
MB-16	613 100 4610	COMPL.SLIDE.CAM
MB-17	613 157 5905	SPRING.LINK LOCK
MB-18	613 022 2725	DAMPER
MB-19	613 022 2534	GEAR.FRONT LOAD
MB-20	613 094 1206	ASSY.LEVER.FRONT
MB-21	613 134 2910	GEAR.HELICAL FRONT
MB-22	411 046 8002	SCR PAN+SW+W 2.6X6
MB-23	411 023 2801	SCR S-TPG PAN 2.6X6
MB-24	411 021 3107	SCR S-TPG BIN 2.6X8
MB-26	645 004 1754	R-SPECIAL DEW SENSOR
MB-28	613 077 3227	HOLDER.WORM
MB-29	613 027 0382	WASHER
MB-30	613 078 8320	ASSY.WORM.FRONT
MB-31	613 117 0599	BRACKET.HOLDER
MB-32	613 093 9159	PLATE.NUT
MB-33	613 093 8374	DAMPER.MOTOR
MB-34	613 077 3616	DAMPER.WORM
MB-35	613 121 9960	ASSY.LOADING MOTOR
MB-36	613 092 9945	DAMPER.MOTOR
MB-37	613 107 2732	COMPL.PCB.MC-3
MB-39	645 008 7837	ROTARY SWITCH
MB-40	411 126 5303	SCR PAN 2.6X13
MB-41	613 092 9921	ASSY.SLIDE.FRONT
MB-42	613 092 5985	SPRING.LEVER LOAD
MB-43	613 092 5992	SPRING.LEVER ACT
MB-44	613 092 5886	HOLDER.WORM
MB-45	613 027 0627	WASHER 2.1X6X0.5
MB-46	613 092 9938	ASSY.WORM.LOAD
MB-47	613 022 2985	BELT.LOADING
MB-48	412 033 4106	WASHER SLIT 2.6X5X0.50
MB-49	613 077 3579	GEAR.HELICAL
MB-50	613 102 9293	ASSY.LEVER.REV GUIDE
MB-51	613 022 1568	SPRING.REVIEW LEVER
MB-52	613 022 0158	COMPL.PINCH ROLLER
MB-53	613 022 1483	SPRING.PINCH ROLLER
MB-54	411 109 2107	WASHER Y 3.6X6X0.5
MB-55	613 078 8160	COMPL.LEVER.ACT BRAKE
MB-56	411 031 1209	SCR BIN 2.6X5
MB-57	613 022 1919	PLATE.GUIDE
MB-58	613 108 2953	ASSY.BASE.ROLLER S
MB-59	613 021 9732	ASSY.BASE.ROLLER T
MB-60	411 063 0904	SCR SET HEX-SCT 2X3
MB-61	613 022 0233	ASSY.GUIDE.ROLLER
MB-62	411 109 2602	WASHER Y 1.5X4X0.25
MB-63	613 086 7452	HEAD.FULL ERASE
MB-64	613 082 4660	IMPEDANCE ROLLER
MB-65	412 032 5807	SPECIAL WASHER 2.1X5X0.13
MB-66	613 136 0334	ASSY.LEVER.FE HEAD
MB-67	613 022 1698	SPRING.ERASE HEAD
MB-80	411 167 9704	WASHER Y 2.7X4.6X0.5
MB-81	613 157 4052	ASSY.ROLLER.CLEANER
MB-82	613 167 6459	ASSY.LEVER.CLEANER TL
MB-83	613 119 8593	SPRING
MB-84	613 142 9055	BRACKET.CLEANER

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MECHANISM PARTS 3

LOCATION	PARTS NO.	DESCRIPTION
MC-1	613 130 9425	MOTOR.CAPSTAN
MC-2	613 093 4031	BELT.REEL DRIVE
MC-3	613 135 4609	COMPL.LEVER.CLUTCH
MC-6	613 022 1520	SPRING.LEVER CLUTCH
MC-7	613 082 3434	LEVER.CHANGE CLUTCH
MC-8	613 022 1711	SPRING.CHANGE CLUTCH
MC-9	613 081 7518	ASSY.BRAKE CAPSTAN
MC-10	613 098 2285	SPRING.CAPSTAN
MC-12	411 021 3107	SCR S-TPG BIN 2.6X8
MC-13	411 109 2008	WASHER Y 3.1X8X0.5
MC-14	613 142 9093	SLIDE.CAM PLATE
MC-15	613 099 7555	CAM.MODE
MC-16	411 109 1902	WASHER Y 3.1X6X0.5
MC-17	613 167 1096	CAM.MAIN TL
MC-18	613 135 7532	ASSY.RACK.LOAD
MC-19	411 109 1803	WASHER Y 2.6X6X0.5
MC-20	613 135 7648	SPACER.RACK LOAD
MC-22	411 047 6809	SCR PAN+FLG 3X4
MC-23	613 021 9763	ASSY.EARTH.CYL
MC-24	613 135 7662	GEAR.LOAD TAKE UP
MC-25	613 022 1551	SPRING.GEAR LOAD T
MC-26	613 021 9879	ASSY.LEVER.LOAD T
MC-27	613 090 6373	GEAR.LOAD S
MC-28	613 022 1704	SPRING.GEAR LOAD S
MC-29	613 021 9862	ASSY.LEVER.LOAD S
MC-30	613 099 7418	LEVER.RETURN TENSION
MC-31	613 091 3104	ASSY.LEVER CONTROL
MC-32	411 087 6005	WASHER V 2.6X7.5X0.5
MC-33	411 022 8903	SCR S-TPG PAN 2.3X12
MC-34	411 040 2303	SCR PAN 2.6X5
MC-35	412 015 8603	SPECIAL WASHER 3.1X6X0.25
MC-36	613 154 0637	ASSY.GEAR.FRICTION
MC-37	411 109 1605	WASHER Y 2.6X6X0.25
MC-38	613 105 5704	SPRING.REVERSE TENSION
MC-39	613 103 2538	BRACKET.PULLEY
MC-40	411 100 0300	SCR S-TPG BIN 2.6X5
MC-41	613 122 9884	COMPL PCB.MC-1

MECHANISM PARTS 2

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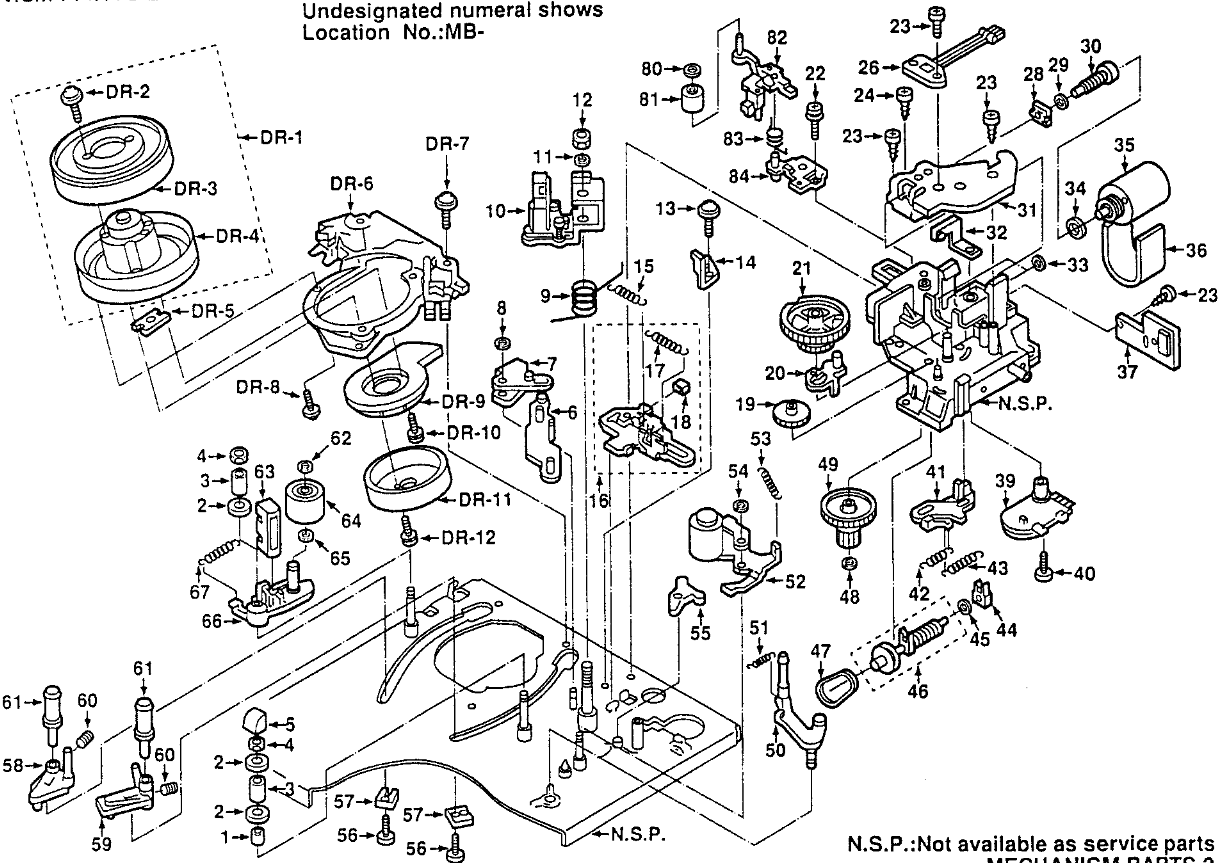
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MECHANISM PARTS 2

95EA4/MB-2

MECHANISM PARTS 3

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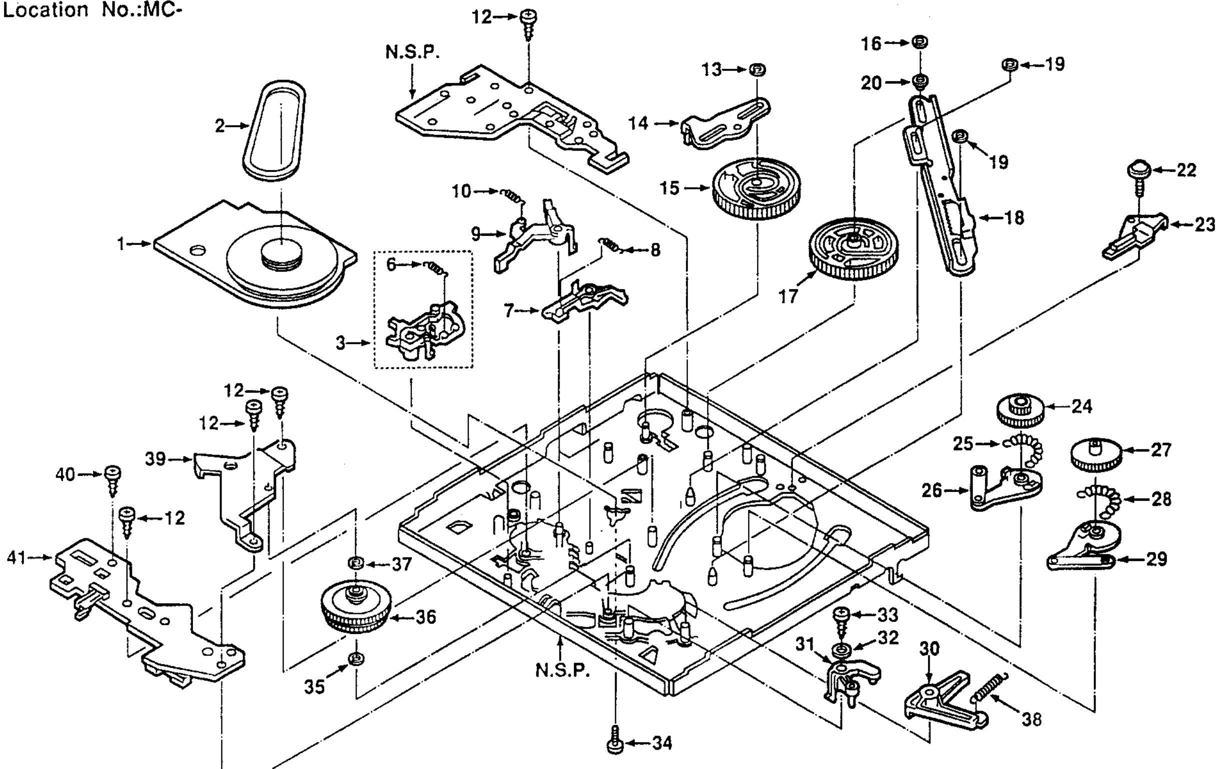
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95EA4/MC-3

N.S.P.:Not available as **service** parts
MECHANI**SM PARTS** 3

ELECTRICAL PARTS

NOTE;

1. Materials of Capacitors and Resistors are abbreviated as follows;

Resistors	
MT-FILM	Metallized Film Resistor
MT-GLAZE	Metallized Glaze Resistor
OXIDE-MT	Oxide Metallized Film Resistor
Capacitors	
MT-POLYEST	Metallized Polyester Capacitor
MT-COMPO	Metallized Composite Capacitor
TA-SOLID	Tantalum Solid Capacitor
AL-SOLID	Aluminum Solid Capacitor
NP-ELECT	Non-Polarized Electrolytic Capacitor
OS-SOLID	Aluminum Solid Capacitors with Organic Semiconductive Electrolytic Capacitor
DL-ELECT	Double Layered Electrolytic Capacitor

2. Tolerance of Capacitor(10pF over) and Resistor are noted with follow symboles.
F ············±1% G ············±2% J ············±5% K ············±10%
M ············±20% N ············±30% Z ············+80% ~ −20%
3. Capacitors
U : uF P : pF
4. Inductors
UH : uH MH : mH
5. N.S.P. : Not available as service parts.

LOCATION	PARTS NO.	DESCRIPTION
COMPL,PWB CP-1-A		
COMPL.NO	613 170 6200	
(SEMICONDUCTORS)		
Q1003	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1004	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1005	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1051	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1052	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1053	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1054	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1055	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1101	405 029 3504	TR DTC144EK
Q1102	405 029 3504	TR DTC144EK
Q1103	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1105	405 029 3504	TR DTC144EK
Q1151	405 029 3504	TR DTC144EK
Q1152	405 029 3504	TR DTC144EK
Q1201	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1202	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1203	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
Q1203	405 014 4608	TR 2SC2412K-S
Q1204	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1205	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1206	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1207	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1208	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1209	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1211	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1212	405 000 2007	TR DTA144EK
Q1261	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1262	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1263	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1264	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1401	405 029 3504	TR DTC144EK
Q1404	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1405	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q1602	405 089 2004	TR 2SC4483-R
OR	405 089 2103	TR 2SC4483-S

LOCATION	PARTS NO.	DESCRIPTION
Q1603	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q1604	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q2001	405 018 0002	TR 2SC3331-S
OR	405 018 0101	TR 2SC3331-T
OR	405 018 0200	TR 2SC3331-U
Q2002	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2003	405 003 7207	TR 2SA1342
OR	405 000 1109	TR DTA124EK
Q2004	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2010	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2011	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2012	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2031	405 018 1900	TR 2SC3395
OR	405 029 3504	TR DTC144EK
Q2051	405 083 5209	TR DTC343TK
Q2052	405 083 5209	TR DTC343TK
Q3001	405 089 2103	TR 2SC4483-S
OR	405 089 2202	TR 2SC4483-T
Q3002	405 089 2103	TR 2SC4483-S
OR	405 089 2202	TR 2SC4483-T
Q3003	405 089 2103	TR 2SC4483-S
OR	405 089 2202	TR 2SC4483-T
Q3004	405 011 8401	TR 2SC1740S-Q
OR	405 011 8500	TR 2SC1740S-R
Q3005	405 089 2103	TR 2SC4483-S
OR	405 089 2202	TR 2SC4483-T
Q3006	405 029 3504	TR DTC144EK
Q3091	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
Q7301	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q7302	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q7303	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q7304	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q7305	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q7308	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q7309	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S
Q7310	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q7311	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q7312	405 002 0209	TR 2SA1037K-Q
Q7312	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q7313	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q7314	405 029 3504	TR DTC144EK
Q7316	405 029 3504	TR DTC144EK
Q7318	405 000 3103	TR DTC114ES
Q7320	405 002 0209	TR 2SA1037K-Q
OR	405 002 0308	TR 2SA1037K-R
OR	405 002 0407	TR 2SA1037K-S
Q7321	405 014 4400	TR 2SC2412K-Q
OR	405 014 4509	TR 2SC2412K-R
OR	405 014 4608	TR 2SC2412K-S

(INTEGRATED CIRCUITS)

LOCATION	PARTS NO.	DESCRIPTION
IC101	409 369 2302	IC LC74781-9013
IC111	409 269 1900	IC LA7395
IC121	409 297 6205	IC LC89925
IC122	409 018 3902	IC LA6393D
IC141	409 143 7905	IC CXA1203M
IC201	409 262 2409	IC LA7285M
IC301	410 265 9302	IC UPD78P4916GF-P01-3BA
IC302	409 329 6302	IC MN1381
IC303	409 314 2005	IC LB1643
IC304	409 114 4100	IC LA7116
IC305	410 172 6807	IC X24C02PC7189
OR	409 348 6802	IC XL24C02P
OR	410 177 3603	IC AT24C02-10PC
OR	410 189 5701	IC 24LC02B/P
IC306	409 313 1009	IC MN1381-R
IC308	409 051 1200	IC TC4030BP

(DIODES)

LOCATION	PARTS NO.	DESCRIPTION
D1001	407 012 4406	DIODE 1SS133
D1101	407 012 4406	DIODE 1SS133
D1104	407 012 4406	DIODE 1SS133
D1105	407 012 4406	DIODE 1SS133
D1152	407 012 4406	DIODE 1SS133
D1601	407 063 8903	ZENER DIODE MTZJ5.6C
D2051	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D2052	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D2055	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D2056	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3001	407 012 4406	DIODE 1SS133
D3004	407 078 2705	DIODE 1SS244
D3005	407 012 4406	DIODE 1SS133
D3006	407 078 2705	DIODE 1SS244
D3008	407 063 8903	ZENER DIODE MTZJ5.6C
D3009	407 063 8903	ZENER DIODE MTZJ5.6C
D3010	407 012 4406	DIODE 1SS133
D3011	407 012 4406	DIODE 1SS133
D3012	407 012 4406	DIODE 1SS133
D3013	407 012 4406	DIODE 1SS133
D3014	407 099 6003	ZENER DIODE MTZJ9.1B
D3015	407 063 8903	ZENER DIODE MTZJ5.6C
D3016	407 012 4406	DIODE 1SS133
D3017	407 120 5807	DIODE AK04
OR	407 160 9100	DIODE ERA83-004
D3091	407 012 4406	DIODE 1SS133

LOCATION	PARTS NO.	DESCRIPTION
D7301	407 012 4406	DIODE 1SS133
OR	407 007 9904	DIODE GMA01
D7302	407 012 4406	DIODE 1SS133
OR	407 007 9904	DIODE GMA01
D7303	407 012 4406	DIODE 1SS133
OR	407 007 9904	DIODE GMA01
D7307	407 012 4406	DIODE 1SS133
OR	407 007 9904	DIODE GMA01

(CRYSTAL DEVICES)

X1001	613 002 8709	CRYSTAL 17.734475MHZ
OR	613 127 1555	OSC,CRYSTAL 17.734475MHZ
OR	645 014 8774	OSC,CRYSTAL 17.734475MHZ
X1101	613 080 9407	OSC,CRYSTAL 4.43MHZ
OR	645 005 1197	OSC,CRYSTAL 4.433619MHZ
OR	613 120 8865	OSC,CRYSTAL 4.433619MHZ
OR	645 014 8231	OSC,CRYSTAL 4.433619MHZ
X3001	613 109 0972	OSC,CRYSTAL 32KHZ
X3002	645 013 5507	OSC,CRYSTAL 8MHZ
OR	645 013 8102	OSC,CRYSTAL 8MHZ

(VARIABLE RESISTŌRS)

VR101	645 003 5265	VR,SEMI,22K N
OR	645 003 5456	VR,SEMI,22K N
VR102	645 003 5258	VR,SEMI.2.2K N
OR	645 003 5449	VR,SEMI,2.2K N
VR103	645 003 5326	VR,SEMI,4.7K N
OR	645 003 5470	VR,SEMI,4.7K N
VR104	645 003 5197	VR,SEMI,10K N
OR	645 002 0919	VR,SEMI 10K N
VR181	645 003 5579	VR,SEMI,2.2K N
OR	645 001 8800	VR,SEMI,2.2K N
VR201	645 003 5548	VR,SEMI,100K N
OR	645 001 8787	VR,SEMI,100K N

(INDUCTŌRS)

L1001	645 001 5458	INDUCTOR 27U J
OR	645 003 8051	INDUCTOR,27U J
L1101	645 001 4574	INDUCTOR 100U J
OR	645 003 7917	INDUCTOR,100U J
L1103	645 002 1466	INDUCTOR 3.3U J
OR	645 003 8075	INDUCTOR,3.3U J
L1105	645 001 5441	INDUCTOR,2.2U K
OR	645 005 3887	INDUCTOR,2.2U M
L1201	645 002 1442	INDUCTOR 18U J
OR	645 003 7986	INDUCTOR,18U J
L1202	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1203	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1204	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1205	645 001 5496	INDUCTOR 39U J
OR	645 003 8129	INDUCTOR,39U J
L1206	645 002 1497	INDUCTOR 56U J
OR	645 003 8181	INDUCTOR,56U J
L1209	645 001 5533	INDUCTOR 82U J
OR	645 003 7610	INDUCTOR,82U J
L1253	645 001 5472	INDUCTOR 33U J
OR	645 003 8105	INDUCTOR,33U J
L1254	645 002 1428	INDUCTOR 15U J
OR	645 003 7955	INDUCTOR,15U J
L1261	645 001 5472	INDUCTOR 33U J
OR	645 003 8105	INDUCTOR,33U J
L1263	645 001 4659	INDUCTOR 220U J
OR	645 003 8037	INDUCTOR,220U J

LOCATION	PARTS NO.	DESCRIPTION
L1264	645 003 6996	INDUCTOR,150U J
OR	645 003 7665	INDUCTOR,150U J
L1402	645 002 1411	INDUCTOR 10U J
OR	645 003 7894	INDUCTOR,10U J
L2001	613 130 3539	FERRITE CORE
OR	645 008 7936	CORE
L2002	645 009 0417	INDUCTOR,10.0M J
L2003	645 003 7238	INDUCTOR,560U J
L7301	645 006 3886	INDUCTOR,1U K
OR	645 005 3856	INDUCTOR,1U M
L7302	645 006 3886	INDUCTOR,1U K
OR	645 005 3856	INDUCTOR,1U M

(TRANSFŌRMERS)

T2001	613 098 6023	TRANS,OSC 70KHZ
OR	621 019 9596	70KHZ OSC TRANS

(DELAY LINES)

DL121	613 116 7001	DELAY,2H
OR	613 117 4870	DELAY,2H

(CAPACITŌRS)

C1001	403 010 8606	CERAMIC	12P J	50V
C1002	403 010 8606	CERAMIC	12P J	50V
C1003	403 018 0602	CERAMIC	22P J	50V
C1004	403 018 0602	CERAMIC	22P J	50V
C1005	403 009 5807	CERAMIC	100P J	50V
C1006	403 009 5807	CERAMIC	100P J	50V
C1007	403 009 5807	CERAMIC	100P J	50V
C1008	403 069 5601	CERAMIC	0.01U K	50V
C1009	403 135 4002	ELECT	47U M	6.3V
C1011	403 069 5601	CERAMIC	0.01U K	50V
C1014	403 009 5807	CERAMIC	100P J	50V
C1018	403 109 6308	ELECT	1U M	50V
C1021	403 121 3507	ELECT	4.7U M	50V
C1022	403 121 3408	ELECT	2.2U M	50V
C1023	403 069 5601	CERAMIC	0.01U K	50V
C1061	403 068 0409	CERAMIC	0.1U Z	25V
C1063	403 135 3302	ELECT	1000U M	6.3V
C1064	403 189 2405	ELECT	10U M	16V
C1065	403 025 1609	CERAMIC	4P C	50V
C1066	403 068 0409	CERAMIC	0.1U Z	25V
C1102	403 010 8606	CERAMIC	12P J	50V
C1103	403 020 0508	CERAMIC	27P J	50V
C1104	403 018 7502	CERAMIC	220P J	50V
C1105	403 022 8304	CERAMIC	33P J	50V
C1106	403 130 2904	ELECT	0.47U M	50V
C1107	403 269 3209	CERAMIC	4.7P C	50V
C1108	403 024 7206	CERAMIC	390P J	50V
C1110	403 269 3209	CERAMIC	4.7P C	50V
C1111	403 033 4609	CERAMIC	82P J	50V
C1112	403 107 9905	ELECT	10U M	16V
C1113	403 107 9905	ELECT	10U M	16V
C1114	403 130 2904	ELECT	0.47U M	50V
C1116	403 069 5601	CERAMIC	0.01U K	50V
C1117	403 130 3109	CERAMIC	0.047U K	50V
C1118	403 020 5602	CERAMIC	270P J	50V
C1119	403 109 6308	ELECT	1U M	50V
C1120	403 109 6308	ELECT	1U M	50V
C1121	403 130 3109	CERAMIC	0.047U K	50V
C1122	403 072 1607	CERAMIC	0.022U K	50V
C1123	403 032 2309	CERAMIC	75P J	50V
C1125	403 109 6308	ELECT	1U M	50V
C1126	403 109 6308	ELECT	1U M	50V
C1127	403 130 3109	CERAMIC	0.047U K	50V
C1128	403 072 1607	CERAMIC	0.022U K	50V
C1129	403 069 5601	CERAMIC	0.01U K	50V

LOCATION	PARTS NO.	DESCRIPTION		
C1130	403 069 5601	CERAMIC	0.01U K	50V
C1131	403 107 9905	ELECT	10U M	16V
C1132	403 135 4002	ELECT	47U M	6.3V
C1133	403 070 2606	CERAMIC	0.1U Z	50V
C1134	403 107 9905	ELECT	10U M	16V
C1135	403 107 9905	ELECT	10U M	16V
C1136	403 069 5601	CERAMIC	0.01U K	50V
C1138	403 012 6907	CERAMIC	15P J	50V
C1140	403 069 5601	CERAMIC	0.01U K	50V
C1141	403 068 0409	CERAMIC	0.1U Z	25V
C1154	403 072 5902	CERAMIC	0.027U K	50V
C1157	403 008 7505	CERAMIC	10P D	50V
C1201	403 026 2902	CERAMIC	47P J	50V
C1202	403 069 5601	CERAMIC	0.01U K	50V
C1204	403 022 8304	CERAMIC	33P J	50V
C1206	403 022 8304	CERAMIC	33P J	50V
C1208	403 020 0508	CERAMIC	27P J	50V
C1209	403 069 5601	CERAMIC	0.01U K	50V
C1212	403 012 6907	CERAMIC	15P J	50V
C1213	403 134 8100	ELECT	100U M	6.3V
C1214	403 012 6907	CERAMIC	15P J	50V
C1216	403 020 0508	CERAMIC	27P J	50V
C1217	403 069 5601	CERAMIC	0.01U K	50V
C1218	403 135 4002	ELECT	47U M	6.3V
C1219	403 069 5601	CERAMIC	0.01U K	50V
C1220	403 147 2904	CERAMIC	4.7P C	50V
C1221	403 026 2902	CERAMIC	47P J	50V
C1222	403 026 2902	CERAMIC	47P J	50V
C1223	403 069 5601	CERAMIC	0.01U K	50V
C1224	403 109 6308	ELECT	1U M	50V
C1225	403 072 1607	CERAMIC	0.022U K	50V
C1226	403 069 5601	CERAMIC	0.01U K	50V
C1227	403 107 9905	ELECT	10U M	16V
C1232	403 069 5601	CERAMIC	0.01U K	50V
C1234	403 069 5601	CERAMIC	0.01U K	50V
C1251	403 018 0602	CERAMIC	22P J	50V
C1252	403 069 5601	CERAMIC	0.01U K	50V
C1253	403 022 8304	CERAMIC	33P J	50V
C1262	403 069 5601	CERAMIC	0.01U K	50V
C1263	403 014 9302	CERAMIC	180P J	50V
C1264	403 069 5601	CERAMIC	0.01U K	50V
C1265	403 069 5601	CERAMIC	0.01U K	50V
C1266	403 069 5601	CERAMIC	0.01U K	50V
C1268	403 030 7009	CERAMIC	68P J	50V
C1269	403 024 7206	CERAMIC	390P J	50V
C1270	403 130 3109	CERAMIC	0.047U K	50V
C1272	403 069 5601	CERAMIC	0.01U K	50V
C1401	403 135 4002	ELECT	47U M	6.3V
C1402	403 069 5601	CERAMIC	0.01U K	50V
C1403	403 018 0602	CERAMIC	22P J	50V
C1404	403 009 5807	CERAMIC	100P J	50V
C1406	403 010 1102	CERAMIC	1000P J	50V
C1407	403 121 3507	ELECT	4.7U M	50V
C1409	403 107 9905	ELECT	10U M	16V
C1410	403 070 8806	CERAMIC	1500P K	50V
C1416	403 010 8606	CERAMIC	12P J	50V
C1417	403 026 2902	CERAMIC	47P J	50V
C1418	403 028 4201	CERAMIC	56P J	50V
C1420	403 069 5601	CERAMIC	0.01U K	50V
C1421	403 068 0409	CERAMIC	0.1U Z	25V
C1602	403 068 0409	CERAMIC	0.1U Z	25V
C2003	403 121 3408	ELECT	2.2U M	50V
C2004	403 107 9905	ELECT	10U M	16V
C2005	403 001 1609	CERAMIC	0.01U K	16V
C2006	403 018 0602	CERAMIC	22P J	50V
C2009	403 121 2401	ELECT	22U M	16V
C2010	403 134 9602	ELECT	47U M	16V
C2013	403 070 9803	CERAMIC	0.015U K	50V

LOCATION	PARTS NO.	DESCRIPTION		
C2016	403 121 3507	ELECT	4.7U M	50V
C2017	403 107 9905	ELECT	10U M	16V
C2019	403 134 9602	ELECT	47U M	16V
C2020	403 071 6504	CERAMIC	220P K	50V
C2021	403 082 4209	POLYPRO	6800P J	100V
C2022	403 069 5601	CERAMIC	0.01U K	50V
C2024	403 069 5601	CERAMIC	0.01U K	50V
C2030	403 107 9905	ELECT	10U M	16V
C2031	403 108 0000	ELECT	0.22U M	50V
C2033	403 138 2500	CERAMIC	0.022U K	16V
C2051	403 111 8000	CERAMIC	1200P J	50V
C2071	403 114 5907	CERAMIC	0.082U K	16V
C2072	403 135 3708	ELECT	33U M	6.3V
C2073	403 130 2904	ELECT	0.47U M	50V
C2091	403 070 2606	CERAMIC	0.1U Z	50V
C2092	403 073 0005	CERAMIC	3300P K	50V
C2101	403 070 2606	CERAMIC	0.1U Z	50V
C3001	403 010 8507	CERAMIC	12P J	50V
C3002	403 018 0503	CERAMIC	22P J	50V
C3003	403 018 0503	CERAMIC	22P J	50V
C3004	403 018 0503	CERAMIC	22P J	50V
C3005	403 135 4002	ELECT	47U M	6.3V
C3006	403 069 5601	CERAMIC	0.01U K	50V
C3007	403 018 7403	CERAMIC	220P J	50V
C3008	403 069 5601	CERAMIC	0.01U K	50V
C3009	403 069 5601	CERAMIC	0.01U K	50V
C3011	403 069 1702	CERAMIC	1000P K	50V
C3012	403 135 4002	ELECT	47U M	6.3V
C3013	403 073 7301	CERAMIC	470P K	50V
C3014	403 135 4002	ELECT	47U M	6.3V
C3015	403 135 4002	ELECT	47U M	6.3V
C3016	403 068 0409	CERAMIC	0.1U Z	25V
C3020	403 109 6308	ELECT	1U M	50V
C3021	403 179 4501	NP-ELECT	0.47U M	50V
C3022	403 154 2102	NP-ELECT	1U M	50V
C3024	403 069 5601	CERAMIC	0.01U K	50V
C3025	403 069 5601	CERAMIC	0.01U K	50V
C3026	403 069 5601	CERAMIC	0.01U K	50V
C3028	403 069 5601	CERAMIC	0.01U K	50V
C3029	403 068 6203	CERAMIC	0.068U Z	25V
C3031	403 068 6203	CERAMIC	0.068U Z	25V
C3032	403 022 8304	CERAMIC	33P J	50V
C3033	403 022 8304	CERAMIC	33P J	50V
C3034	403 022 8304	CERAMIC	33P J	50V
C3035	403 028 4201	CERAMIC	56P J	50V
C3036	403 028 4201	CERAMIC	56P J	50V
C3037	403 028 4201	CERAMIC	56P J	50V
C3038	403 135 3302	ELECT	1000U M	6.3V
C3039	403 121 2401	ELECT	22U M	16V
C3040	403 135 3500	ELECT	220U M	6.3V
C3041	403 121 2401	ELECT	22U M	16V
C3042	403 135 4002	ELECT	47U M	6.3V
C3043	403 068 0409	CERAMIC	0.1U Z	25V
C3044	403 068 0409	CERAMIC	0.1U Z	25V
C3045	403 107 9905	ELECT	10U M	16V
C3049	403 068 0409	CERAMIC	0.1U Z	25V
C3050	403 068 0409	CERAMIC	0.1U Z	25V
C3054	403 069 5601	CERAMIC	0.01U K	50V
C3055	403 135 4002	ELECT	47U M	6.3V
C3056	403 130 2904	ELECT	0.47U M	50V
C3057	403 073 9107	CERAMIC	4700P K	50V
C3058	403 191 8709	ELECT	1U M	50V
C3059	403 073 9107	CERAMIC	4700P K	50V
C3060	403 191 8709	ELECT	1U M	50V
C3061	403 135 4002	ELECT	47U M	6.3V
C3062	403 009 5807	CERAMIC	100P J	50V
C3063	403 009 5807	CERAMIC	100P J	50V
C3064	403 121 2401	ELECT	22U M	16V

LOCATION	PARTS NO.	DESCRIPTION
C3065	403 121 2401	ELECT 22U M 16V
C3066	403 135 3500	ELECT 220U M 6.3V
C3067	403 068 0409	CERAMIC 0.1U Z 25V
C3069	403 068 0409	CERAMIC 0.1U Z 25V
C3070	403 107 9905	ELECT 10U M 16V
C3072	403 018 7403	CERAMIC 220P J 50V
C3073	403 069 1702	CERAMIC 1000P K 50V
C3074	403 068 0409	CERAMIC 0.1U Z 25V
C3079	403 069 5601	CERAMIC 0.01U K 50V
C3080	403 069 5601	CERAMIC 0.01U K 50V
C3081	403 069 5601	CERAMIC 0.01U K 50V
C3091	403 018 7502	CERAMIC 220P J 50V
C3092	403 010 8507	CERAMIC 12P J 50V
C3101	403 070 2606	CERAMIC 0.1U Z 50V
C3102	403 121 3408	ELECT 2.2U M 50V
C3503	403 068 0409	CERAMIC 0.1U Z 25V
C7301	403 069 1702	CERAMIC 1000P K 50V
C7302	403 069 1702	CERAMIC 1000P K 50V
C7307	403 069 1702	CERAMIC 1000P K 50V
C7308	403 069 1702	CERAMIC 1000P K 50V
C7309	403 069 1702	CERAMIC 1000P K 50V
C7310	403 069 1702	CERAMIC 1000P K 50V
C7311	403 069 1702	CERAMIC 1000P K 50V
(RESISTORS)		
R1012	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1013	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1014	401 038 7908	MT-GLAZE 560K JA 1/10W
R1015	401 037 7800	MT-GLAZE 150 JA 1/10W
R1016	401 037 7800	MT-GLAZE 150 JA 1/10W
R1017	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1066	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1067	401 037 5400	MT-GLAZE 1K JA 1/10W
R1068	401 037 5400	MT-GLAZE 1K JA 1/10W
R1069	401 038 9506	MT-GLAZE 75 JA 1/10W
R1070	401 038 9308	MT-GLAZE 68K JA 1/10W
R1071	401 038 7809	MT-GLAZE 56K JA 1/10W
R1072	401 038 9001	MT-GLAZE 680 JA 1/10W
R1073	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1074	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1075	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1076	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1077	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1078	401 037 5400	MT-GLAZE 1K JA 1/10W
R1101	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1102	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R1103	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1104	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1105	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1106	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1107	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1108	401 038 9001	MT-GLAZE 680 JA 1/10W
R1110	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1111	401 037 5202	MT-GLAZE 100 JA 1/10W
R1114	401 038 3702	MT-GLAZE 33K JA 1/10W
R1115	401 038 0800	MT-GLAZE 22K JA 1/10W
R1116	401 037 5806	MT-GLAZE 1M JA 1/10W
R1117	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1118	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R1119	401 037 5400	MT-GLAZE 1K JA 1/10W
R1120	401 037 5400	MT-GLAZE 1K JA 1/10W
R1121	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1123	401 038 0800	MT-GLAZE 22K JA 1/10W
R1124	401 037 5400	MT-GLAZE 1K JA 1/10W
R1125	401 038 0800	MT-GLAZE 22K JA 1/10W
R1126	401 037 5400	MT-GLAZE 1K JA 1/10W
R1127	401 038 8905	MT-GLAZE 68 JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R1129	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R1130	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1131	401 037 6803	MT-GLAZE 12K JA 1/10W
R1132	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1133	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1134	401 038 3504	MT-GLAZE 330 JA 1/10W
R1151	401 038 3702	MT-GLAZE 33K JA 1/10W
R1153	401 037 5608	MT-GLAZE 10K JA 1/10W
R1154	401 037 5608	MT-GLAZE 10K JA 1/10W
R1155	401 038 0800	MT-GLAZE 22K JA 1/10W
R1156	401 037 5400	MT-GLAZE 1K JA 1/10W
R1201	401 037 5400	MT-GLAZE 1K JA 1/10W
R1202	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1203	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1204	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1205	401 037 5400	MT-GLAZE 1K JA 1/10W
R1206	401 038 2002	MT-GLAZE 270 JA 1/10W
R1207	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1208	401 039 0304	MT-GLAZE 820 JA 1/10W
R1209	401 037 5400	MT-GLAZE 1K JA 1/10W
R1210	401 037 5400	MT-GLAZE 1K JA 1/10W
R1211	401 039 0304	MT-GLAZE 820 JA 1/10W
R1212	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1213	401 038 3504	MT-GLAZE 330 JA 1/10W
R1214	401 037 5400	MT-GLAZE 1K JA 1/10W
R1215	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1216	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1217	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1218	401 037 5400	MT-GLAZE 1K JA 1/10W
R1219	401 038 7601	MT-GLAZE 560 JA 1/10W
R1220	401 037 5400	MT-GLAZE 1K JA 1/10W
R1221	401 037 5400	MT-GLAZE 1K JA 1/10W
R1222	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1224	401 037 5608	MT-GLAZE 10K JA 1/10W
R1225	401 037 5608	MT-GLAZE 10K JA 1/10W
R1226	401 038 3801	MT-GLAZE 330K JA 1/10W
R1228	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1229	401 037 5400	MT-GLAZE 1K JA 1/10W
R1230	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1231	401 037 5707	MT-GLAZE 100K JA 1/10W
R1251	401 038 6307	MT-GLAZE 470 JA 1/10W
R1254	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1263	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1264	401 038 0800	MT-GLAZE 22K JA 1/10W
R1265	401 038 0800	MT-GLAZE 22K JA 1/10W
R1266	401 037 5400	MT-GLAZE 1K JA 1/10W
R1267	401 037 5400	MT-GLAZE 1K JA 1/10W
R1268	401 038 2002	MT-GLAZE 270 JA 1/10W
R1269	401 037 5400	MT-GLAZE 1K JA 1/10W
R1402	401 038 6307	MT-GLAZE 470 JA 1/10W
R1403	401 038 7601	MT-GLAZE 560 JA 1/10W
R1404	401 038 7601	MT-GLAZE 560 JA 1/10W
R1407	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1408	401 037 5608	MT-GLAZE 10K JA 1/10W
R1409	401 037 5707	MT-GLAZE 100K JA 1/10W
R1411	401 038 3801	MT-GLAZE 330K JA 1/10W
R1413	401 038 0800	MT-GLAZE 22K JA 1/10W
R1418	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1419	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1421	401 038 3504	MT-GLAZE 330 JA 1/10W
R1422	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1423	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1424	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1425	401 038 2002	MT-GLAZE 270 JA 1/10W
R1427	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1428	401 037 8104	MT-GLAZE 150K JA 1/10W
R1602	401 038 9001	MT-GLAZE 680 JA 1/10W
R1603	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1604	401 038 6406	MT-GLAZE 4.7K JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R1605	401 038 6505	MT-GLAZE 47K JA 1/10W
R1606	401 038 6505	MT-GLAZE 47K JA 1/10W
R2001	401 037 5202	MT-GLAZE 100 JA 1/10W
R2002	401 038 6505	MT-GLAZE 47K JA 1/10W
R2003	401 037 7206	MT-GLAZE 130 JA 1/10W
R2004	401 038 3801	MT-GLAZE 330K JA 1/10W
R2005	401 037 5608	MT-GLAZE 10K JA 1/10W
R2009	401 037 5806	MT-GLAZE 1M JA 1/10W
R2010	401 037 8005	MT-GLAZE 15K JA 1/10W
R2011	401 037 5608	MT-GLAZE 10K JA 1/10W
R2012	401 037 8005	MT-GLAZE 15K JA 1/10W
R2013	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R2014	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R2018	401 038 0800	MT-GLAZE 22K JA 1/10W
R2021	401 038 3405	MT-GLAZE 33 JA 1/10W
R2022	401 038 6208	MT-GLAZE 47 JA 1/10W
R2023	401 037 8005	MT-GLAZE 15K JA 1/10W
R2024	401 038 8103	MT-GLAZE 6.8 JA 1/10W
R2035	401 037 5608	MT-GLAZE 10K JA 1/10W
R2037	401 037 5608	MT-GLAZE 10K JA 1/10W
R2038	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R2042	401 037 5707	MT-GLAZE 100K JA 1/10W
R2050	401 038 8905	MT-GLAZE 68 JA 1/10W
R2051	401 037 5608	MT-GLAZE 10K JA 1/10W
R2071	401 038 7502	MT-GLAZE 56 JA 1/10W
R2091	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R2094	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R2095	401 037 5608	MT-GLAZE 10K JA 1/10W
R2101	401 038 7809	MT-GLAZE 56K JA 1/10W
R2102	401 037 8005	MT-GLAZE 15K JA 1/10W
R2105	401 038 7601	MT-GLAZE 560 JA 1/10W
R2106	401 038 7601	MT-GLAZE 560 JA 1/10W
R3001	401 038 3801	MT-GLAZE 330K JA 1/10W
R3002	401 039 0601	MT-GLAZE 820K JA 1/10W
R3003	401 038 2200	MT-GLAZE 27K JA 1/10W
R3004	401 038 2309	MT-GLAZE 270K JA 1/10W
R3005	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3006	401 038 6505	MT-GLAZE 47K JA 1/10W
R3007	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3008	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3009	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3010	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3011	401 037 5400	MT-GLAZE 1K JA 1/10W
R3012	401 037 5400	MT-GLAZE 1K JA 1/10W
R3013	401 037 5400	MT-GLAZE 1K JA 1/10W
R3014	401 037 5400	MT-GLAZE 1K JA 1/10W
R3015	401 037 5400	MT-GLAZE 1K JA 1/10W
R3016	401 037 5400	MT-GLAZE 1K JA 1/10W
R3017	401 038 0305	MT-GLAZE 200K JA 1/10W
R3018	401 038 0305	MT-GLAZE 200K JA 1/10W
R3019	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3020	401 037 5400	MT-GLAZE 1K JA 1/10W
R3021	401 037 5400	MT-GLAZE 1K JA 1/10W
R3022	401 037 5400	MT-GLAZE 1K JA 1/10W
R3023	401 038 9001	MT-GLAZE 680 JA 1/10W
R3024	401 038 9001	MT-GLAZE 680 JA 1/10W
R3028	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3029	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3031	401 037 5608	MT-GLAZE 10K JA 1/10W
R3033	401 038 3702	MT-GLAZE 33K JA 1/10W
R3034	401 037 5608	MT-GLAZE 10K JA 1/10W
R3036	401 038 3702	MT-GLAZE 33K JA 1/10W
R3037	401 037 5608	MT-GLAZE 10K JA 1/10W
R3038	401 037 5400	MT-GLAZE 1K JA 1/10W
R3039	401 037 5400	MT-GLAZE 1K JA 1/10W
R3040	401 037 5400	MT-GLAZE 1K JA 1/10W
R3041	401 037 5400	MT-GLAZE 1K JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R3042	401 038 7601	MT-GLAZE 560 JA 1/10W
R3043	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R3044	401 022 1806	CARBON 680 JA 1/4W
R3045	401 020 0702	CARBON 470 JA 1/4W
R3046	401 038 3801	MT-GLAZE 330K JA 1/10W
R3048	401 019 0904	CARBON 390 JA 1/4W
R3049	401 022 0700	CARBON 68 JA 1/4W
R3050	401 022 0700	CARBON 68 JA 1/4W
R3053	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R3055	401 037 5400	MT-GLAZE 1K JA 1/10W
R3056	401 037 5400	MT-GLAZE 1K JA 1/10W
R3057	401 038 7700	MT-GLAZE 5.6K JA 1/10W
R3058	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3059	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R3060	401 037 5400	MT-GLAZE 1K JA 1/10W
R3061	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3062	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3063	401 037 5400	MT-GLAZE 1K JA 1/10W
R3064	401 037 5400	MT-GLAZE 1K JA 1/10W
R3065	401 037 5608	MT-GLAZE 10K JA 1/10W
R3066	401 038 0909	MT-GLAZE 220K JA 1/10W
R3067	401 037 5608	MT-GLAZE 10K JA 1/10W
R3068	401 038 0909	MT-GLAZE 220K JA 1/10W
R3069	401 020 0702	CARBON 470 JA 1/4W
R3070	401 020 0702	CARBON 470 JA 1/4W
R3071	401 037 5400	MT-GLAZE 1K JA 1/10W
R3072	401 038 6307	MT-GLAZE 470 JA 1/10W
R3073	401 038 3801	MT-GLAZE 330K JA 1/10W
R3074	401 037 5608	MT-GLAZE 10K JA 1/10W
R3075	401 037 5400	MT-GLAZE 1K JA 1/10W
R3077	401 037 5608	MT-GLAZE 10K JA 1/10W
R3078	401 037 5608	MT-GLAZE 10K JA 1/10W
R3079	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3080	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R3081	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3082	401 037 5400	MT-GLAZE 1K JA 1/10W
R3084	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R3085	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3087	401 037 5608	MT-GLAZE 10K JA 1/10W
R3088	401 038 6505	MT-GLAZE 47K JA 1/10W
R3089	401 037 5400	MT-GLAZE 1K JA 1/10W
R3090	401 037 5608	MT-GLAZE 10K JA 1/10W
R3091	401 038 6505	MT-GLAZE 47K JA 1/10W
R3092	401 038 0800	MT-GLAZE 22K JA 1/10W
R3093	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3094	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3095	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3101	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3102	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R3103	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R3104 ⚠	402 036 3701	FUSIBLE RES 3.3 JA 1/2W
R3105	401 037 5608	MT-GLAZE 10K JA 1/10W
R3106	401 037 5608	MT-GLAZE 10K JA 1/10W
R7301	401 037 5608	MT-GLAZE 10K JA 1/10W
R7303	401 037 5608	MT-GLAZE 10K JA 1/10W
R7304	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
R7305	401 037 5400	MT-GLAZE 1K JA 1/10W
R7306	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7307	401 037 5608	MT-GLAZE 10K JA 1/10W
R7308	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
R7309	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
R7310	401 037 5608	MT-GLAZE 10K JA 1/10W
R7312	401 037 5608	MT-GLAZE 10K JA 1/10W
R7313	401 037 5608	MT-GLAZE 10K JA 1/10W
R7314	401 037 5608	MT-GLAZE 10K JA 1/10W
R7315	401 037 5608	MT-GLAZE 10K JA 1/10W
R7316	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7317	401 037 5004	MT-GLAZE 0.000 ZA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R7318	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7320	401 037 5608	MT-GLAZE 10K JA 1/10W
R7323	401 037 5608	MT-GLAZE 10K JA 1/10W
R7327	401 037 5608	MT-GLAZE 10K JA 1/10W
R7328	401 037 5608	MT-GLAZE 10K JA 1/10W
R7330	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7331	401 037 5608	MT-GLAZE 10K JA 1/10W
R7332	401 037 5608	MT-GLAZE 10K JA 1/10W
R7333	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7334	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
R7335	401 037 5608	MT-GLAZE 10K JA 1/10W
R7336	401 037 5608	MT-GLAZE 10K JA 1/10W
R7337	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7338	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
R7339	401 037 5400	MT-GLAZE 1K JA 1/10W
R7340	401 037 5608	MT-GLAZE 10K JA 1/10W
R7341	401 037 5608	MT-GLAZE 10K JA 1/10W
R7342	401 037 5608	MT-GLAZE 10K JA 1/10W
R7343	401 037 5400	MT-GLAZE 1K JA 1/10W
R7344	401 037 5608	MT-GLAZE 10K JA 1/10W
R7345	401 037 5608	MT-GLAZE 10K JA 1/10W
R7346	401 037 5608	MT-GLAZE 10K JA 1/10W
R7347	401 037 5400	MT-GLAZE 1K JA 1/10W
R7348	401 037 5608	MT-GLAZE 10K JA 1/10W
R7349	401 037 5608	MT-GLAZE 10K JA 1/10W
R7350	401 037 5608	MT-GLAZE 10K JA 1/10W
R7351	401 037 5400	MT-GLAZE 1K JA 1/10W
R7352	401 037 5608	MT-GLAZE 10K JA 1/10W
R7353	401 037 5608	MT-GLAZE 10K JA 1/10W
R7354	401 037 5608	MT-GLAZE 10K JA 1/10W
R7355	401 018 2701	CARBON 330 JA 1/4W
R7358	401 037 5608	MT-GLAZE 10K JA 1/10W
R7359	401 037 5608	MT-GLAZE 10K JA 1/10W
R7360	401 037 5608	MT-GLAZE 10K JA 1/10W
R7361	401 037 5400	MT-GLAZE 1K JA 1/10W
R7362	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
R7363	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7364	401 037 5608	MT-GLAZE 10K JA 1/10W
R7365	401 037 5608	MT-GLAZE 10K JA 1/10W
R7366	401 037 5608	MT-GLAZE 10K JA 1/10W
R7368	401 037 5608	MT-GLAZE 10K JA 1/10W
R7370	401 037 5608	MT-GLAZE 10K JA 1/10W

(JUMPERS)

LOCATION	PARTS NO.	DESCRIPTION
J1023	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1201	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1202	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1203	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1205	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1206	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1207	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1528	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1529	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1530	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1541	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1545	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J2050	401 037 5004	MT-GLAZE 0.000 ZA 1/10W

(MISCELLANEOUS)

LOCATION	PARTS NO.	DESCRIPTION
	613 050 1882	EARTH PLATE
	645 008 8070	FIXER
	645 006 4425	FIXER
BZ730	419 002 1500	PIEZO BUZZER CB13PA-X5
Z3001 ⚠	645 017 8870	BATTERY,RECHARGE

CAUTION

Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer.

Discard used batteries according to the manufacturer's instructions.

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COMPL.PWB VP-1

COMPL.NO 613 170 4190

(SEMICONDUCTORS)

LOCATION	PARTS NO.	DESCRIPTION
Q1801	405 099 8508	TR 2SC4640S
OR	405 011 8401	TR 2SC1740S-Q
OR	405 093 0607	TR KSC2785-Y
OR	405 099 8607	TR 2SC4640T
OR	405 011 8500	TR 2SC1740S-R
Q1802	405 099 8508	TR 2SC4640S
OR	405 011 8401	TR 2SC1740S-Q
OR	405 093 0607	TR KSC2785-Y
OR	405 099 8607	TR 2SC4640T
OR	405 011 8500	TR 2SC1740S-R
Q1803	405 000 6104	TR DTC144ES
Q1804	405 099 8508	TR 2SC4640S
OR	405 011 8401	TR 2SC1740S-Q
OR	405 093 0607	TR KSC2785-Y
OR	405 099 8607	TR 2SC4640T
OR	405 011 8500	TR 2SC1740S-R
Q1805	405 099 8201	TR 2SA1782S
OR	405 006 1707	TR 2SA933S-Q
OR	405 093 0508	TR KSA1175-Y
OR	405 099 8300	TR 2SA1782T-AC
OR	405 006 1806	TR 2SA933S-R
Q1806	405 099 8508	TR 2SC4640S
OR	405 011 8401	TR 2SC1740S-Q
OR	405 093 0607	TR KSC2785-Y
OR	405 099 8607	TR 2SC4640T
OR	405 011 8500	TR 2SC1740S-R
Q1831	405 099 8508	TR 2SC4640S
OR	405 011 8401	TR 2SC1740S-Q
OR	405 093 0607	TR KSC2785-Y
OR	405 099 8607	TR 2SC4640T
OR	405 011 8500	TR 2SC1740S-R
Q1832	405 016 0905	TR 2SC2839-E-SPA
OR	405 016 1100	TR 2SC2839-F-SPA
OR	405 012 9506	TR 2SC2058S-Q
Q1833	405 000 6104	TR DTC144ES
Q1834	405 016 0905	TR 2SC2839-E-SPA
OR	405 016 1100	TR 2SC2839-F-SPA
OR	405 012 9506	TR 2SC2058S-Q
Q1835	405 099 8201	TR 2SA1782S
OR	405 006 1707	TR 2SA933S-Q
OR	405 093 0508	TR KSA1175-Y
OR	405 099 8300	TR 2SA1782T-AC
OR	405 006 1806	TR 2SA933S-R

(INTEGRATED CIRCUIT)

LOCATION	PARTS NO.	DESCRIPTION
IC181	409 262 2003	IC LA7374

(DIODES)

LOCATION	PARTS NO.	DESCRIPTION
D1881	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133

(VARIABLE RESISTORS)

LOCATION	PARTS NO.	DESCRIPTION
VR182	645 003 5685	VR,SEMI,2.2K N
OR	645 003 5142	VR,SEMI,2.2K N

(INDUCTORS)

LOCATION	PARTS NO.	DESCRIPTION
L1803	645 002 1510	INDUCTOR 68U J
OR	645 003 8228	INDUCTOR,68U J

LOCATION	PARTS NO.	DESCRIPTION
L1804	645 002 1435	INDUCTOR 150U J
OR	645 011 1556	INDUCTOR,150U J
L1805	645 002 1442	INDUCTOR 18U J
OR	645 003 7986	INDUCTOR,18U J
L1831	645 002 1428	INDUCTOR 15U J
OR	645 003 7955	INDUCTOR,15U J
L1832	645 002 1428	INDUCTOR 15U J
OR	645 003 7955	INDUCTOR,15U J
L1833	645 001 4574	INDUCTOR 100U J
OR	645 003 7917	INDUCTOR,100U J
L1834	645 001 5502	INDUCTOR 47U J
OR	645 003 8150	INDUCTOR,47U J
L1835	645 002 1480	INDUCTOR 5.6U J
OR	645 003 8167	INDUCTOR,5.6U J

(CAPACITORS)

C1801	403 001 1906	CERAMIC	0.01U	M	16V
C1804	403 070 7205	CERAMIC	150P	J	50V
C1805	403 071 1509	CERAMIC	180P	J	50V
C1807	403 001 1906	CERAMIC	0.01U	M	16V
C1808	403 001 1906	CERAMIC	0.01U	M	16V
C1809	403 019 9703	CERAMIC	27P	J	50V
C1810	403 009 1809	CERAMIC	10P	J	50V
C1811	403 001 1906	CERAMIC	0.01U	M	16V
C1812	403 001 1906	CERAMIC	0.01U	M	16V
C1813	403 001 1906	CERAMIC	0.01U	M	16V
C1817	403 163 7907	ELECT	47U	M	6.3V
C1818	403 001 1906	CERAMIC	0.01U	M	16V
C1831	403 026 2209	CERAMIC	47P	J	50V
C1833	403 074 8703	CERAMIC	680P	J	50V
C1834	403 022 7703	CERAMIC	33P	J	50V
C1836	403 022 7703	CERAMIC	33P	J	50V
C1837	403 001 1906	CERAMIC	0.01U	M	16V
C1839	403 163 7907	ELECT	47U	M	6.3V
C1840	403 001 1906	CERAMIC	0.01U	M	16V
C1881	403 001 1906	CERAMIC	0.01U	M	16V
C1882	403 284 9408	OS-SOLID	3.3U	M	16V
C1883	403 129 9709	CERAMIC	0.015U	K	16V
C1884	403 001 1906	CERAMIC	0.01U	M	16V
C1885	403 193 8509	ELECT	0.33U	M	50V
C1886	403 001 1906	CERAMIC	0.01U	M	16V
C1887	403 001 1906	CERAMIC	0.01U	M	16V
C1890	403 001 1906	CERAMIC	0.01U	M	16V
C1892	403 001 1906	CERAMIC	0.01U	M	16V
C1893	403 120 9609	CERAMIC	0.047U	J	16V
C1894	403 120 9609	CERAMIC	0.047U	J	16V
C1895	403 120 9609	CERAMIC	0.047U	J	16V
C1896	403 120 9609	CERAMIC	0.047U	J	16V
C1897	403 001 1906	CERAMIC	0.01U	M	16V

(RESISTORS)

R1801	401 015 2605	CARBON	1.8K	JA	1/4W
R1803	401 018 3708	CARBON	3.3K	JA	1/4W
R1804	401 022 3008	CARBON	6.8K	JA	1/4W
R1805	401 021 2903	CARBON	5.6K	JA	1/4W
R1806	401 018 3708	CARBON	3.3K	JA	1/4W
R1807	401 013 5202	CARBON	1.2K	JA	1/4W
R1808	401 012 6903	CARBON	10K	JA	1/4W
R1809	401 012 6903	CARBON	10K	JA	1/4W
R1810	401 012 5609	CARBON	1K	JA	1/4W
R1811	401 012 5609	CARBON	1K	JA	1/4W
R1812	401 012 5609	CARBON	1K	JA	1/4W
R1813	401 023 1607	CARBON	820	JA	1/4W
R1814	401 021 1807	CARBON	560	JA	1/4W
R1815	401 012 5609	CARBON	1K	JA	1/4W
R1816	401 017 1705	CARBON	2.7K	JA	1/4W
R1817	401 012 5609	CARBON	1K	JA	1/4W
R1818	401 016 4707	CARBON	22K	JA	1/4W
R1819	401 016 4707	CARBON	22K	JA	1/4W
R1820	401 012 5609	CARBON	1K	JA	1/4W
R1823	401 016 3700	CARBON	2.2K	JA	1/4W
R1831	401 012 5609	CARBON	1K	JA	1/4W
R1832	401 023 1607	CARBON	820	JA	1/4W
R1833	401 023 1607	CARBON	820	JA	1/4W
R1834	401 019 0904	CARBON	390	JA	1/4W
R1835	401 022 7105	CARBON	750	JA	1/4W
R1836	401 014 4006	CARBON	1.5K	JA	1/4W
R1837	401 022 1806	CARBON	680	JA	1/4W
R1838	401 022 1806	CARBON	680	JA	1/4W
R1840	401 015 2605	CARBON	1.8K	JA	1/4W
R1841	401 015 2605	CARBON	1.8K	JA	1/4W
R1842	401 012 5609	CARBON	1K	JA	1/4W
R1843	401 012 5609	CARBON	1K	JA	1/4W
R1881	401 013 6308	CARBON	12K	JA	1/4W
R1882	401 021 2903	CARBON	5.6K	JA	1/4W
R1883	401 012 5609	CARBON	1K	JA	1/4W
R1884	401 012 5609	CARBON	1K	JA	1/4W
R1887	401 022 3008	CARBON	6.8K	JA	1/4W
R1889	401 018 4804	CARBON	33K	JA	1/4W
R1891	401 016 3700	CARBON	2.2K	JA	1/4W
R1892	401 016 4707	CARBON	22K	JA	1/4W

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COMPL,PWB TM-1

COMPL.NO 613 170 5210

(INTEGRATED CIRCUIT)

IC711	409 375 6707	IC MN12510

(DIODES)

D7101	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7102	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7103	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7104	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7105	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7130	407 078 2705	DIODE 1SS244
D7133	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7136	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7138	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133

(CRISTAL DEVICE)

X7101	645 006 3435	OSC,CERAMIC 4.000MHZ

(CAPACITORS)

C7103	403 139 1809	ELECT	47U	M	16V
C7104	403 001 1906	CERAMIC	0.01U	M	16V
C7105	403 121 9509	CERAMIC	0.1U	Z	50V
C7108	403 068 9402	CERAMIC	100P	K	50V
C7110	403 074 6303	CERAMIC	560P	K	50V
C7111	403 074 6303	CERAMIC	560P	K	50V
C7112	403 074 6303	CERAMIC	560P	K	50V
C7113	403 074 6303	CERAMIC	560P	K	50V

(RESISTORS)

R7102	401 021 1807	CARBON	560	JA	1/4W
R7103	401 021 1807	CARBON	560	JA	1/4W
R7104	401 021 1807	CARBON	560	JA	1/4W
R7105	401 021 1807	CARBON	560	JA	1/4W
R7106	401 012 8006	CARBON	100K	JA	1/4W

LOCATION	PARTS NO.	DESCRIPTION
R7107	401 012 8006	CARBON 100K JA 1/4W
R7108	401 012 8006	CARBON 100K JA 1/4W
R7109	401 012 8006	CARBON 100K JA 1/4W
R7114	401 022 4005	CARBON 68K JA 1/4W
R7115	401 022 4005	CARBON 68K JA 1/4W
R7116	401 022 4005	CARBON 68K JA 1/4W
R7117	401 022 4005	CARBON 68K JA 1/4W
R7118	401 022 4005	CARBON 68K JA 1/4W
R7120	401 020 1907	CARBON 4.7K JA 1/4W
R7121	401 020 1907	CARBON 4.7K JA 1/4W
R7122	401 022 4005	CARBON 68K JA 1/4W
R7123	401 022 4005	CARBON 68K JA 1/4W
R7124	401 022 4005	CARBON 68K JA 1/4W
R7125	401 022 4005	CARBON 68K JA 1/4W
(SWITCHES)		
S7102	645 006 2797	SWITCH,PUSH 1P-1T,TIMER
OR	645 008 8049	SWITCH,PUSH 1P-1T,TIMER
OR	645 011 5172	SWITCH,PUSH 1P-1T,TIMER
OR	645 011 5165	SWITCH,PUSH 1P-1T,TIMER
S7104	645 006 2797	SWITCH,PUSH 1P-1T,MENU RESET
OR	645 008 8049	SWITCH,PUSH 1P-1T,MENU RESET
OR	645 011 5172	SWITCH,PUSH 1P-1T,MENU RESET
OR	645 011 5165	SWITCH,PUSH 1P-1T,MENU RESET
S7105	645 006 2797	SWITCH,PUSH 1P-1T,SHIFT RIGHT
OR	645 008 8049	SWITCH,PUSH 1P-1T,SHIFT RIGHT
OR	645 011 5172	SWITCH,PUSH 1P-1T,SHIFT RIGHT
OR	645 011 5165	SWITCH,PUSH 1P-1T,SHIFT RIGHT
S7106	645 006 2797	SWITCH,PUSH 1P-1T,SHIFT DOWN
OR	645 008 8049	SWITCH,PUSH 1P-1T,SHIFT DOWN
OR	645 011 5172	SWITCH,PUSH 1P-1T,SHIFT DOWN
OR	645 011 5165	SWITCH,PUSH 1P-1T,SHIFT DOWN
S7107	645 006 2797	SWITCH,PUSH 1P-1T,MENU
OR	645 008 8049	SWITCH,PUSH 1P-1T,MENU
OR	645 011 5172	SWITCH,PUSH 1P-1T,MENU
OR	645 011 5165	SWITCH,PUSH 1P-1T,MENU
S7108	645 006 2797	SWITCH,PUSH 1P-1T,SEARCH/AD PLAY
OR	645 008 8049	SWITCH,PUSH 1P-1T,SEARCH/AD PLAY
OR	645 011 5172	SWITCH,PUSH 1P-1T,SEARCH/AD PLAY
OR	645 011 5165	SWITCH,PUSH 1P-1T,SEARCH/AD PLAY
S7109	645 006 2797	SWITCH,PUSH 1P-1T,R/P SPEED UP
OR	645 008 8049	SWITCH,PUSH 1P-1T,R/P SPEED UP
OR	645 011 5172	SWITCH,PUSH 1P-1T,R/P SPEED UP
OR	645 011 5165	SWITCH,PUSH 1P-1T,R/P SPEED UP
S7110	645 006 2797	SWITCH,PUSH 1P-1T,R/P SPEED DOWN
OR	645 008 8049	SWITCH,PUSH 1P-1T,R/P SPEED DOWN
OR	645 011 5172	SWITCH,PUSH 1P-1T,R/P SPEED DOWN
OR	645 011 5165	SWITCH,PUSH 1P-1T,R/P SPEED DOWN
S7111	645 006 2797	SWITCH,PUSH 1P-1T,CT.MEMORY
OR	645 008 8049	SWITCH,PUSH 1P-1T,CT.MEMORY
OR	645 011 5172	SWITCH,PUSH 1P-1T,CT.MEMORY
OR	645 011 5165	SWITCH,PUSH 1P-1T,CT.MEMORY
S7112	645 006 2797	SWITCH,PUSH 1P-1T,CT. RESET
OR	645 008 8049	SWITCH,PUSH 1P-1T,CT. RESET
OR	645 011 5172	SWITCH,PUSH 1P-1T,CT. RESET
OR	645 011 5165	SWITCH,PUSH 1P-1T,CT. RESET
S7113	645 006 2797	SWITCH,PUSH 1P-1T,STILL
OR	645 008 8049	SWITCH,PUSH 1P-1T,STILL
OR	645 011 5172	SWITCH,PUSH 1P-1T,STILL
OR	645 011 5165	SWITCH,PUSH 1P-1T,STILL
S7114	645 006 2797	SWITCH,PUSH 1P-1T,PLAY
OR	645 008 8049	SWITCH,PUSH 1P-1T,PLAY
OR	645 011 5172	SWITCH,PUSH 1P-1T,PLAY
OR	645 011 5165	SWITCH,PUSH 1P-1T,PLAY
S7115	645 006 2797	SWITCH,PUSH 1P-1T,FF
OR	645 008 8049	SWITCH,PUSH 1P-1T,FF
OR	645 011 5172	SWITCH,PUSH 1P-1T,FF
OR	645 011 5165	SWITCH,PUSH 1P-1T,FF
S7116	645 006 2797	SWITCH,PUSH 1P-1T,REW
S7116	645 008 8049	SWITCH,PUSH 1P-1T,REW
OR	645 011 5172	SWITCH,PUSH 1P-1T,REW
OR	645 011 5165	SWITCH,PUSH 1P-1T,REW
S7117	645 006 2797	SWITCH,PUSH 1P-1T,STOP
OR	645 008 8049	SWITCH,PUSH 1P-1T,STOP
OR	645 011 5172	SWITCH,PUSH 1P-1T,STOP
OR	645 011 5165	SWITCH,PUSH 1P-1T,STOP
S7120	645 006 2797	SWITCH,PUSH 1P-1T,RVS PLAY
OR	645 008 8049	SWITCH,PUSH 1P-1T,RVS PLAY
OR	645 011 5172	SWITCH,PUSH 1P-1T,RVS PLAY
OR	645 011 5165	SWITCH,PUSH 1P-1T,RVS PLAY
S7128	645 006 2797	SWITCH,PUSH 1P-1T
OR	645 008 8049	SWITCH,PUSH 1P-1T
OR	645 011 5172	SWITCH,PUSH 1P-1T
OR	645 011 5165	SWITCH,PUSH 1P-1T
(DISPLAYS)		
A7101	613 115 9792	FLUORESCENT TUBE
OR	613 117 0629	FLUORESCENT TUBE
(MISCELLANEOUS)		
	613 108 4230	HOLDER,FLD_HOLDER

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COMPL.,PWB TM-2

COMPL.NO 613 170 5227

(SEMICONDUCTORS)		
Q7201	405 063 8404	TR DTC114EL
OR	405 123 6302	TR UN6211
(DIODES)		
D7201	407 148 8408	LED SEL2210R-C
OR	407 148 8507	LED SEL2210R-D
D7203	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7204	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7205	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7206	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7207	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7208	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7209	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7210	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7211	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D7212	407 149 8506	LED SEL2410G-D
(VARIABLE RESISTOR)		
VR721	645 008 8025	VR,ROTARY 3KB
(RESISTORS)		
R7201	401 019 1802	CARBON 3.9K JA 1/4W
R7202	401 015 1509	CARBON 180 JA 1/4W
R7205	401 019 1802	CARBON 3.9K JA 1/4W
R7206	401 014 2804	CARBON 150 JA 1/4W
(SWITCHES)		
S7201	645 006 2797	SWITCH,PUSH 1P-1T,TR+
OR	645 008 8049	SWITCH,PUSH 1P-1T,TR+
OR	645 011 5172	SWITCH,PUSH 1P-1T,TR+
OR	645 011 5165	SWITCH,PUSH 1P-1T,TR+

LOCATION	PARTS NO.	DESCRIPTION
S7202	645 006 2797	SWITCH,PUSH 1P-1T,TR-
OR	645 008 8049	SWITCH,PUSH 1P-1T,TR-
OR	645 011 5172	SWITCH,PUSH 1P-1T,TR-
OR	645 011 5165	SWITCH,PUSH 1P-1T,TR-
S7203	645 006 2797	SWITCH,PUSH 1P-1T,POWER
OR	645 008 8049	SWITCH,PUSH 1P-1T,POWER
OR	645 011 5172	SWITCH,PUSH 1P-1T,POWER
OR	645 011 5165	SWITCH,PUSH 1P-1T,POWER
S7205	645 006 2797	SWITCH,PUSH 1P-1T,EJECT
OR	645 008 8049	SWITCH,PUSH 1P-1T,EJECT
OR	645 011 5172	SWITCH,PUSH 1P-1T,EJECT
OR	645 011 5165	SWITCH,PUSH 1P-1T,EJECT
S7206	645 013 7709	SWITCH,SLIDE 2P-2T,REPEAT
S7207	645 013 7716	SWITCH,SLIDE 2P-3T,ALARM S SW
S7208	645 013 7716	SWITCH,SLIDE 2P-3T,ALARM D SW
S7212	645 013 7709	SWITCH,SLIDE 2P-2T,OSD
S7213	645 006 2797	SWITCH,PUSH 1P-1T,REC
OR	645 008 8049	SWITCH,PUSH 1P-1T,REC
OR	645 011 5172	SWITCH,PUSH 1P-1T,REC
OR	645 011 5165	SWITCH,PUSH 1P-1T,REC

(MISCELLANEOUS)

LOCATION	PARTS NO.	DESCRIPTION
	613 160 0621	HOLDER LED

* * *

COMPL,PWB PW-1

COMPL.NO 613 170 4671

(SEMICONDUCTOR)

LOCATION	PARTS NO.	DESCRIPTION
Q5001	405 126 0208	TR 2SK1460LS

(INTEGRATED CIRCUITS)

LOCATION	PARTS NO.	DESCRIPTION
IC501	409 363 1004	IC TDA4605-3
IC511	409 067 7203	IC L5431
OR	409 180 2307	IC UPC1093J
IC512	409 225 2309	IC PQ12RF11

(DIODES)

LOCATION	PARTS NO.	DESCRIPTION
D5001	407 134 8900	DIODE DBC10G
D5002	407 091 6704	DIODE AP01C
D5003	407 078 2705	DIODE 1SS244
D5011 ⚠	407 151 3308	PHOTO COUPLE PC120FB
D5101	407 169 5707	DIODE RL2Z-LF-C4
OR	407 160 9308	DIODE ERB93-02L3
D5102	407 169 5707	DIODE RL2Z-LF-C4
OR	407 160 9308	DIODE ERB93-02L3
D5103	407 078 2705	DIODE 1SS244
D5104	407 100 6909	DIODE AG01
D5105	407 004 9709	DIODE DSK10C
OR	407 005 8701	DIODE ERA15-02
D5106	407 063 9306	ZENER DIODE MTZJ7.5C
D5110	407 120 5807	DIODE AK04
OR	407 160 9100	DIODE ERA83-004
D5111	407 120 5807	DIODE AK04
OR	407 160 9100	DIODE ERA83-004

(INDUCTORS)

LOCATION	PARTS NO.	DESCRIPTION
L5002 ⚠	645 008 7417	LINE FILTER
OR ⚠	645 013 5620	LINE FILTER
L5003	645 006 3602	INDUCTOR,1.1UH
L5101	645 011 6957	INDUCTOR,10U
L5102	645 011 6957	INDUCTOR,10U
L5103	645 006 3602	INDUCTOR,1.1UH

(TRANSFORMER)

LOCATION	PARTS NO.	DESCRIPTION
T5001 ⚠	645 017 4735	TRANS,POWER,PULSE

(CAPACITORS)

LOCATION	PARTS NO.	DESCRIPTION
C5001 ⚠	404 066 9500	MT-POLYEST 0.068U K 250V
C5002 ⚠	404 066 9500	MT-POLYEST 0.068U K 250V
C5004 ⚠	404 067 4900	CERAMIC 1000P M 400V
C5005 ⚠	404 067 4900	CERAMIC 1000P M 400V
C5010	403 249 0204	ELECT 47U M 400V
C5011	403 137 4604	MT-POLYEST 0.047U K 630V
C5012	403 255 8409	CERAMIC 39P J 1K
C5014	403 061 1601	POLYESTER 3900P J 50V
C5015	403 301 1309	ELECT 47U M 35V
C5016	403 168 6103	MT-POLYEST 0.1U J 50V
C5017	403 061 7504	POLYESTER 4700P J 50V
C5018	403 168 6103	MT-POLYEST 0.1U J 50V
C5101	403 301 2405	ELECT 1000U M 16V
C5102	403 304 9203	ELECT 220U M 16V
C5103	403 301 2405	ELECT 1000U M 16V
C5104	403 304 9203	ELECT 220U M 16V
C5105	403 301 1309	ELECT 47U M 35V
C5106	403 301 1507	ELECT 220U M 6.3V
C5107	403 121 9509	CERAMIC 0.1U Z 50V
C5108	403 125 5606	ELECT 100U M 16V
C5110	403 304 8909	ELECT 2.2U M 50V
C5115	403 121 9509	CERAMIC 0.1U Z 50V

(RESISTORS)

LOCATION	PARTS NO.	DESCRIPTION
R5002	402 013 9108	SOLID 2.7M KB 1/2W
R5010	401 069 4402	OXIDE-MT 68K JA 2W
R5011	401 019 3905	CARBON 390K JA 1/4W
R5012	401 019 3905	CARBON 390K JA 1/4W
R5013	401 017 3709	CARBON 270K JA 1/4W
R5014	401 017 3709	CARBON 270K JA 1/4W
R5015	401 013 6308	CARBON 12K JA 1/4W
R5016	401 018 3708	CARBON 3.3K JA 1/4W
R5017	401 016 2505	CARBON 220 JA 1/4W
R5018	401 012 6903	CARBON 10K JA 1/4W
R5019	401 019 6104	CARBON 4.7 JA 1/4W
R5020	401 012 6903	CARBON 10K JA 1/4W
R5021	401 012 5609	CARBON 1K JA 1/4W
R5022	401 016 4707	CARBON 22K JA 1/4W
R5023	401 016 4707	CARBON 22K JA 1/4W
R5024	401 016 4707	CARBON 22K JA 1/4W
R5025	401 016 4707	CARBON 22K JA 1/4W
R5101 ⚠	402 004 2200	FUSIBLE RES 5.6 JA 1/4W
R5103	401 012 6903	CARBON 10K JA 1/4W
R5105	401 022 1806	CARBON 680 JA 1/4W
R5106	401 107 5200	MT-FILM 560 FD 1/4W
R5107	401 107 5309	MT-FILM 620 FD 1/4W
R5108	401 042 0308	MT-FILM 120 FD 1/4W
R5110	401 020 0702	CARBON 470 JA 1/4W
R5111	401 022 1806	CARBON 680 JA 1/4W
R5112	401 013 6308	CARBON 12K JA 1/4W

(FUSE)

LOCATION	PARTS NO.	DESCRIPTION
F5001 ⚠	423 021 8402	FUSE 250V 2.5A

(PROTECTORS)

LOCATION	PARTS NO.	DESCRIPTION
PR511 ⚠	645 009 6396	PROTECTOR,IC 1.0A 50V
PR512 ⚠	645 014 2529	PROTECTOR,1.25A 125V

(CONNECTOR)

LOCATION	PARTS NO.	DESCRIPTION
CN501 ⚠	645 008 7691	SOCKET,INLET AC

(MISCELLANEOUS)

LOCATION	PARTS NO.	DESCRIPTION
	645 008 7677	HOLDER,FUSE,F5001
	645 008 7660	HOLDER,FUSE,F5001
VA501	408 023 9701	VARISTER ENC471D-05AS6

* * *

COMPL,PWB TB-1

COMPL.NO 613 170 4206

LOCATION	PARTS NO.	DESCRIPTION
(INTEGRATED CIRCUIT)		
IC851	409 272 3106	IC BA15218
(DIODES)		
D8513	407 099 7000	ZENER DIODE MTZJ15B
OR	407 099 7109	ZENER DIODE MTZJ15C
OR	407 099 6904	ZENER DIODE MTZJ15A
D8514	407 099 7000	ZENER DIODE MTZJ15B
OR	407 099 7109	ZENER DIODE MTZJ15C
OR	407 099 6904	ZENER DIODE MTZJ15A
(CAPACITORS)		
C8502	403 139 1007	ELECT 47U M 6.3V
C8503	403 139 1502	ELECT 10U M 16V
C8504	403 068 9402	CERAMIC 100P K 50V
C8505	403 121 9509	CERAMIC 0.1U Z 50V
C8508	403 121 9509	CERAMIC 0.1U Z 50V
C8509	403 069 1207	CERAMIC 1000P K 50V
C8510	403 121 9509	CERAMIC 0.1U Z 50V
C8511	403 139 1502	ELECT 10U M 16V
C8512	403 069 1207	CERAMIC 1000P K 50V
C8513	403 069 1207	CERAMIC 1000P K 50V
C8514	403 139 2905	ELECT 2.2U M 50V
C8515	403 121 9509	CERAMIC 0.1U Z 50V
C8517	403 069 1207	CERAMIC 1000P K 50V
C8519	403 139 1502	ELECT 10U M 16V
C8520	403 121 9509	CERAMIC 0.1U Z 50V
C8522	403 121 9509	CERAMIC 0.1U Z 50V
C8523	403 121 9509	CERAMIC 0.1U Z 50V
(RESISTORS)		
R8501	401 020 2805	CARBON 47K JA 1/4W
R8503	401 012 6903	CARBON 10K JA 1/4W
R8504	401 012 6903	CARBON 10K JA 1/4W
R8505	401 012 6903	CARBON 10K JA 1/4W
R8506	401 012 8006	CARBON 100K JA 1/4W
R8507	401 019 2908	CARBON 39K JA 1/4W
R8508	401 012 4404	CARBON 100 JA 1/4W
R8509	401 014 4006	CARBON 1.5K JA 1/4W
R8510	401 022 6702	CARBON 75 JA 1/4W
R8514	401 012 6903	CARBON 10K JA 1/4W
R8515	401 012 5609	CARBON 1K JA 1/4W
R8516	401 012 5609	CARBON 1K JA 1/4W
R8517	401 012 5609	CARBON 1K JA 1/4W
R8518	401 012 5609	CARBON 1K JA 1/4W
R8519	401 012 5609	CARBON 1K JA 1/4W
R8520	401 012 5609	CARBON 1K JA 1/4W
R8521	401 012 5609	CARBON 1K JA 1/4W
(RELAYS)		
RY851	645 009 3753	RELAY
RY852	645 009 3753	RELAY
(JACKS)		
JK851	645 005 0237	SOCKET,BNC 1P
JK852	645 005 0237	SOCKET,BNC 1P
JK853	613 009 1659	SOCKET,AUDIO OUT
JK854	613 009 1659	SOCKET,AUDIO IN
JK855	613 087 2791	JACK,MIC,MIC IN
JK856	613 091 4071	JACK,HEADPHONE,REMOTE IN

****

COMPL PCB,MC-1

COMPL.NO 613 122 9884

LOCATION	PARTS NO.	DESCRIPTION
(DIODES)		
D8001	407 094 1300	PHOTO COUPLE SPI-315-04-C
OR	407 043 0101	PHOTO DIODE ON2170-R
D8002	407 094 1300	PHOTO COUPLE SPI-315-04-C
OR	407 043 0101	PHOTO DIODE ON2170-R
(RESISTORS)		
R8001	401 026 0607	CARBON 270 JA 1/6W
OR	401 017 0708	CARBON 270 JA 1/4W
R8002	401 024 6700	CARBON 100 JA 1/6W
OR	401 012 4404	CARBON 100 JA 1/4W
(SWITCH)		
S8001	645 008 7813	SWITCH,LEAF 1P-1T

****

TLS-2100P

BLOCK DIAGRAMS,CIRCUIT DIAGRAMS & PRINTED WIRING BOARDS

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NOTES:

1. All resistance values in "OHMS" unless otherwise noted.
   (K=1,000 ; M=1,000,000)
2. All capacitance values in "μF" unless otherwise noted.
   p=pico farad ; μ ,u or U=micro farad
3. All inductance values in "μH" unless otherwise noted.
   μ ,u or U=micro henry ; m=milli henry

PRODUCT SAFETY NOTICE

THE COMPONENTS DESIGNATED BY A SYMBOL (⚠) IN THIS SCHEMATIC DIAGRAM DESIGNATES COMPONENTS WHOSE VALUE ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY.

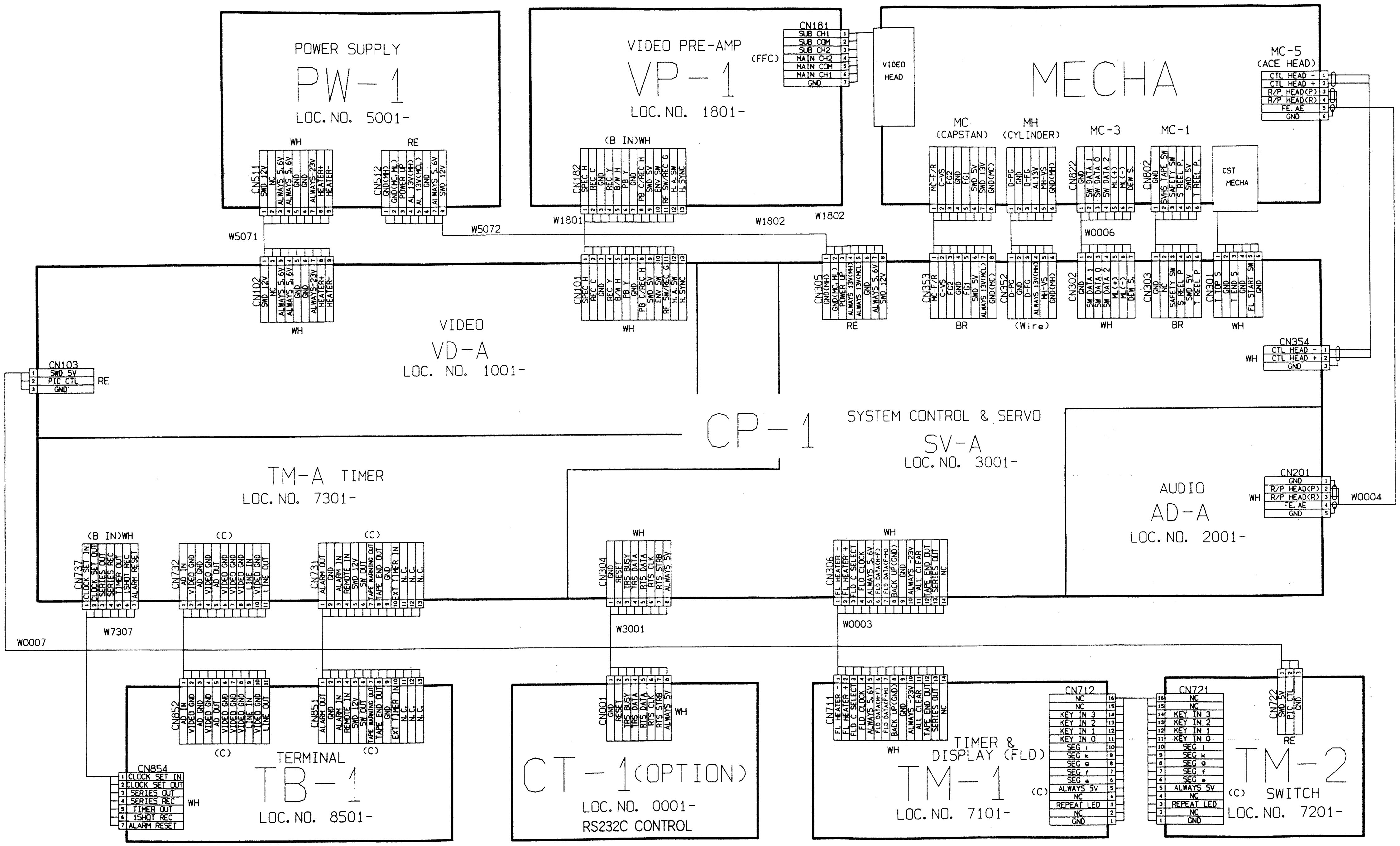
SHOULD ANY COMPONENT DESIGNATED BY A SYMBOL NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST.

DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.

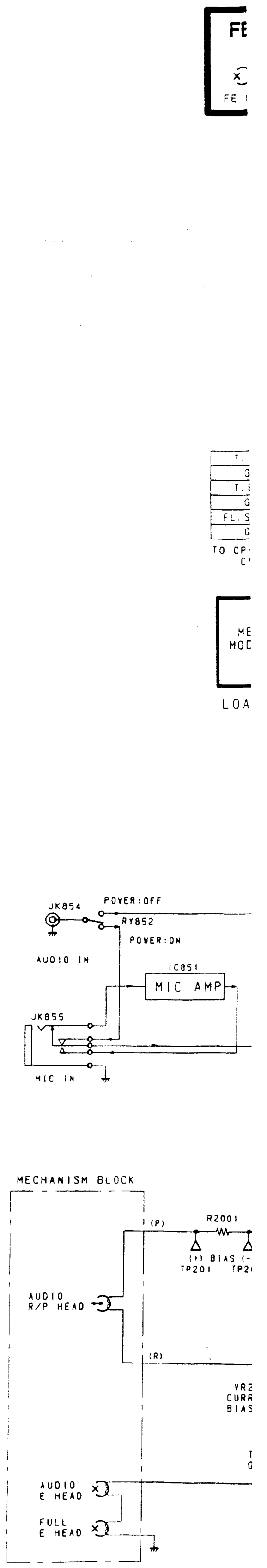
PAL-B

1. OVERALL WIRING & BLOCK DIAGRAMS

OVERALL WIRING

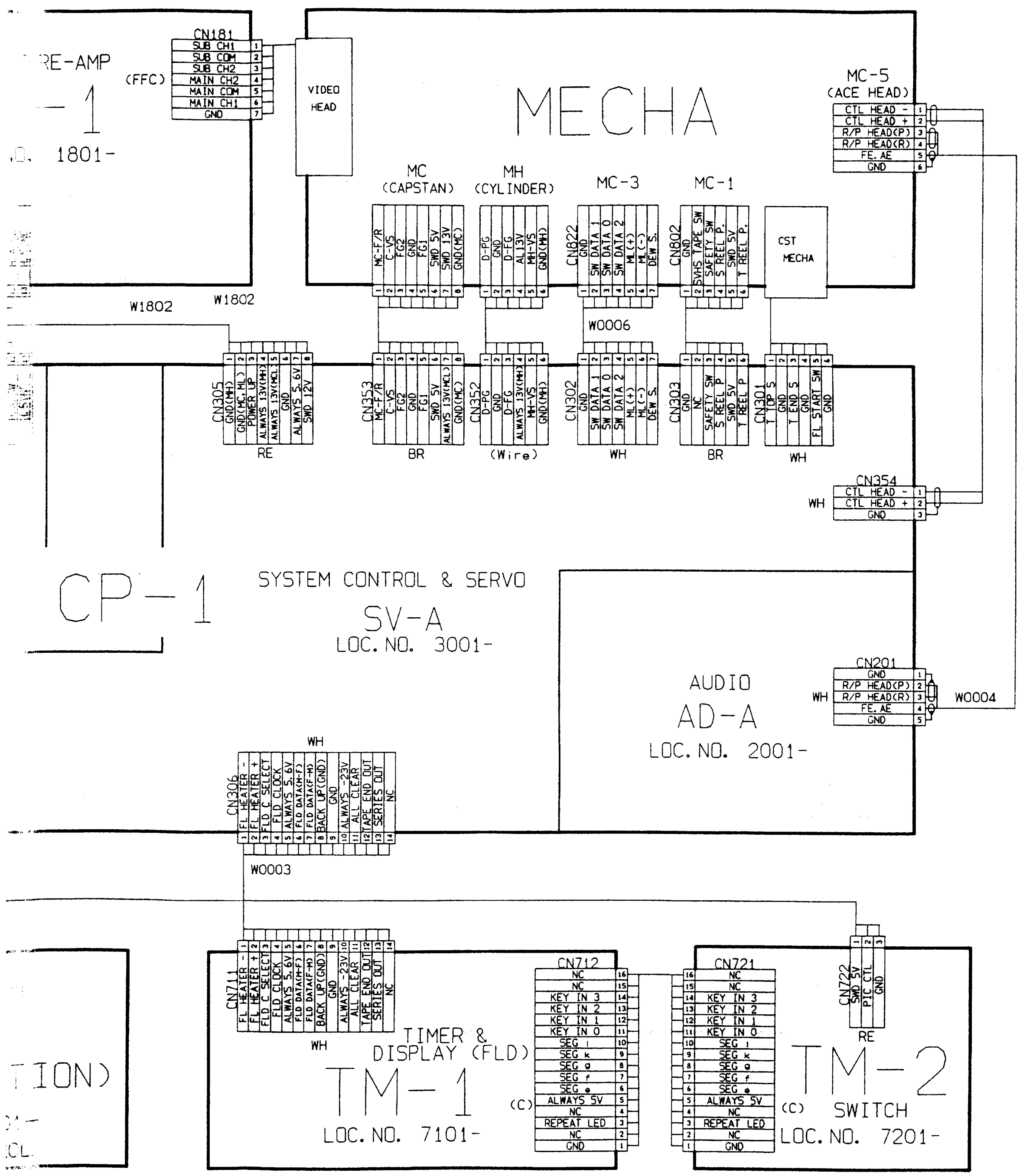


POWER SUPPLY
PW-1
LOC. NO. 5001-
VIDEO PRE-AMP
VP-1
(FFC)
LOC. NO. 1801-
CN181
VIDEO HEAD
MECHA
MC-5 (ACE HEAD)
MC (CAPSTAN)
MH (CYLINDER)
MC-3
MC-1
CST MECHA
CN511
CN512
CN182
CN822
CN802
W5071
W5072
W1801
W1802
W0006
CN102
CN101
CN305
CN353
CN352
CN302
CN303
CN301
CN354
CN103
VIDEO
VD-A
LOC. NO. 1001-
CP-1
SYSTEM CONTROL & SERVO
SV-A
LOC. NO. 3001-
TM-A TIMER
LOC. NO. 7301-
AUDIO
AD-A
LOC. NO. 2001-
CN201
W0004
CN737
CN732
CN731
CN304
CN306
W7307
W3001
W0003
W0007
CN852
CN851
CN001
CN711
CN712
CN721
CN722
CN854
TERMINAL
TB-1
LOC. NO. 8501-
CT-1 (OPTION)
LOC. NO. 0001-
RS232C CONTROL
TIMER & DISPLAY (FLD)
TM-1
LOC. NO. 7101-
TM-2
SWITCH
LOC. NO. 7201-



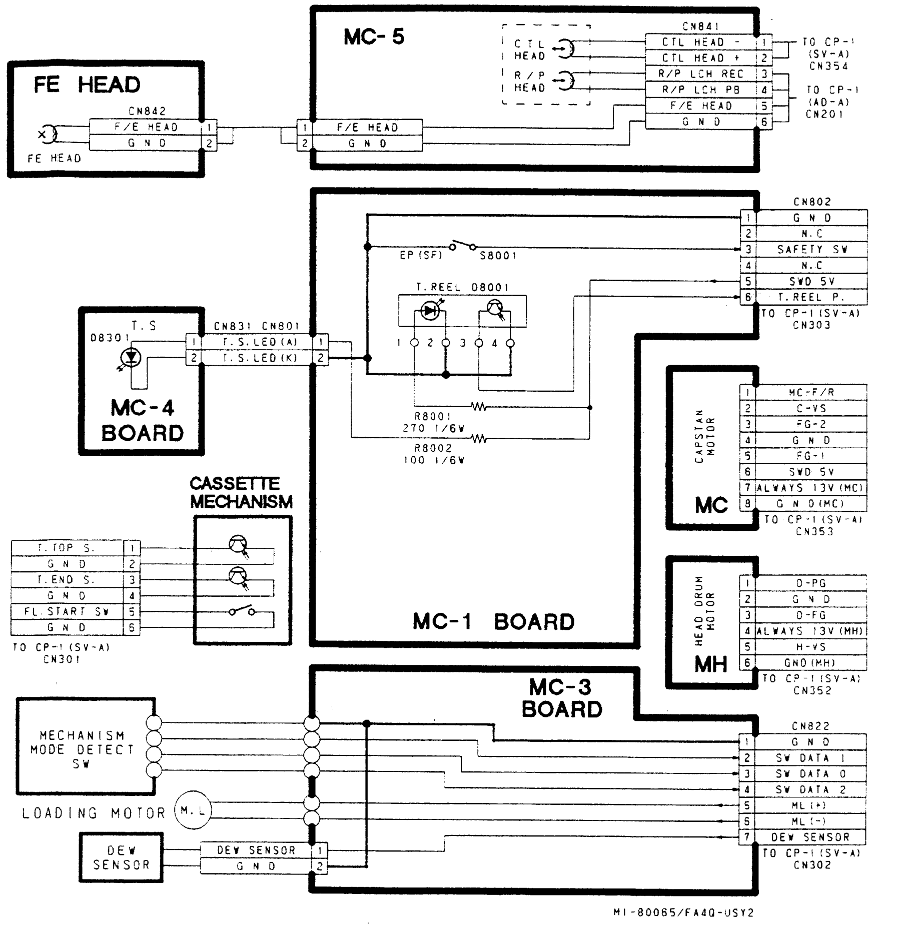
JK854
POWER:OFF
RY852
POWER:ON
AUDIO IN
IC851
MIC AMP
JK855
MIC IN
MECHANISM BLOCK
R2001
AUDIO R/P HEAD
AUDIO E HEAD
FULL E HEAD

RALL WIRING



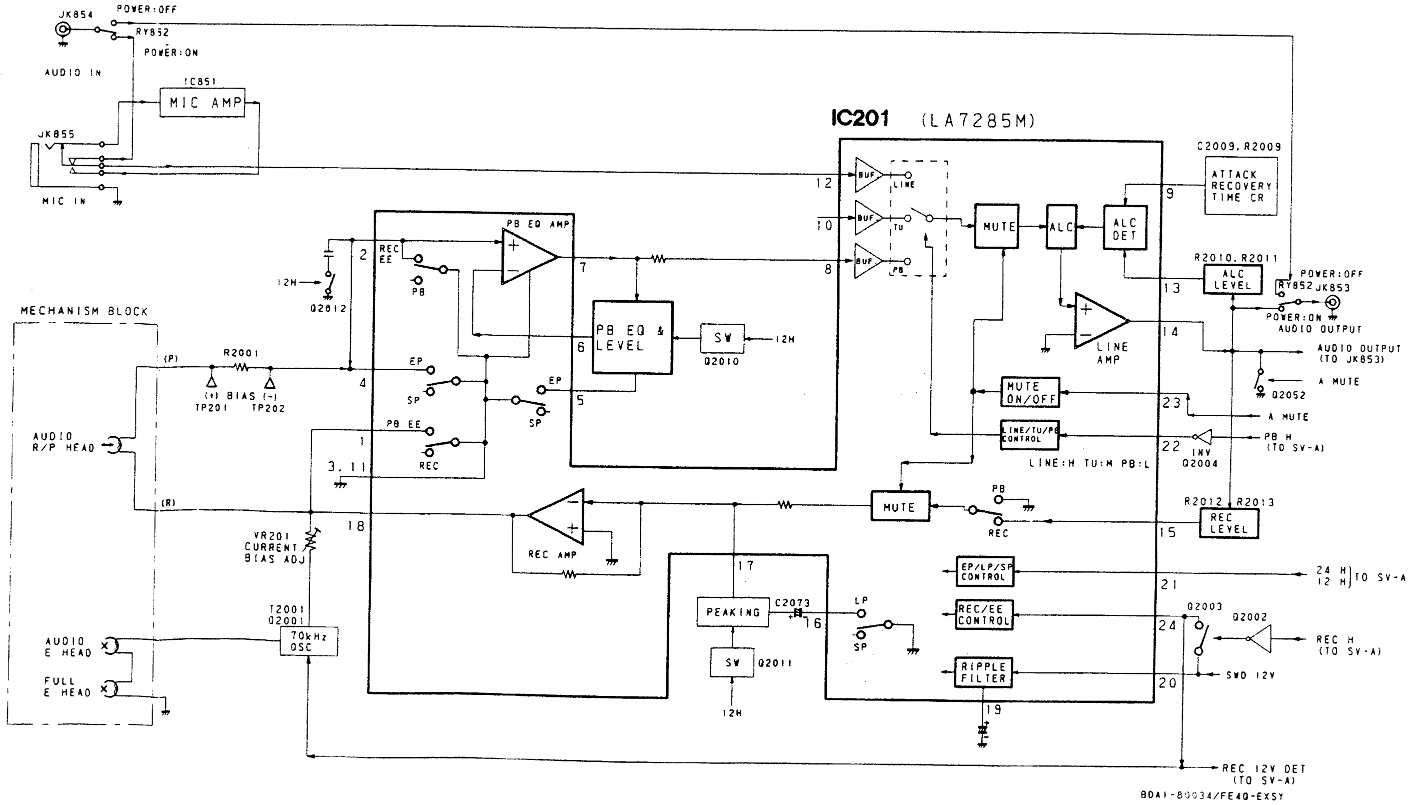
RE-AMP
(FFC)
-1
1801-
CN181
SUB CH1
SUB COM
SUB CH2
MAIN CH2
MAIN COM
MAIN CH1
GND
VIDEO HEAD
MECHA
MC-5
(ACE HEAD)
CTL HEAD -
CTL HEAD +
R/P HEAD(P)
R/P HEAD(R)
FE.AE
GND
MC
(CAPSTAN)
MH
(CYLINDER)
MC-3
MC-1
CST MECHA
CN822
CN802
W1802
W0006
CN305
CN353
CN352
CN302
CN303
CN301
RE
BR
(Wire)
WH
CN354
CP-1
SYSTEM CONTROL & SERVO
SV-A
LOC. NO. 3001-
AUDIO
AD-A
LOC. NO. 2001-
CN201
W0004
CN306
W0003
CN711
CN712
CN721
CN722
TIMER & DISPLAY (FLD)
TM-1
LOC. NO. 7101-
(C)
TM-2
SWITCH
LOC. NO. 7201-
TION)

MECHANISM CONNECTION



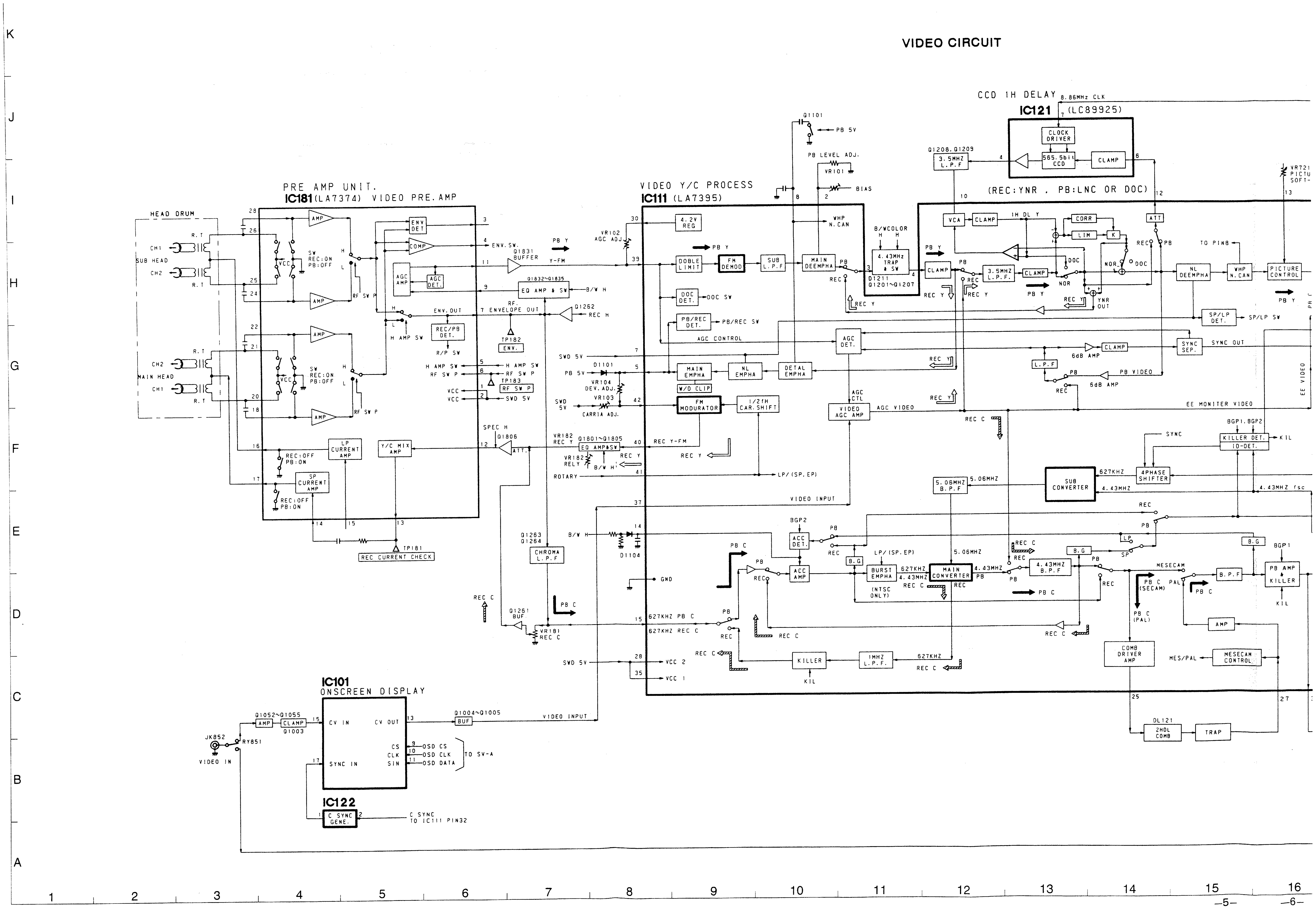
FE HEAD
CN842
F/E HEAD
GND
MC-5
CTL HEAD
R/P HEAD
CN841
CTL HEAD -
CTL HEAD +
R/P LCH REC
R/P LCH PB
F/E HEAD
TO CP-1 (SV-A) CN354
TO CP-1 (AD-A) CN201
CN802
N.C
SAFETY SW
SWD 5V
T.REEL P.
TO CP-1 (SV-A) CN303
EP (SF)
S8001
T.REEL D8001
R8001 270 1/6W
R8002 100 1/6W
T.S
D8301
CN831
CN801
T.S.LED (A)
T.S.LED (K)
MC-4 BOARD
CASSETTE MECHANISM
T.TOP S.
T.END S.
FL START SW
TO CP-1 (SV-A) CN301
MC-1 BOARD
CAPSTAN MOTOR
MC
MC-F/R
C-VS
FG-2
FG-1
ALWAYS 13V (MC)
GND (MC)
TO CP-1 (SV-A) CN353
HEAD DRUM MOTOR
MH
D-PG
D-FG
ALWAYS 13V (MH)
H-VS
GND (MH)
TO CP-1 (SV-A) CN352
MC-3 BOARD
MECHANISM MODE DETECT SW
LOADING MOTOR
M-L
DEW SENSOR
CN822
SW DATA 1
SW DATA 0
SW DATA 2
ML(+)
ML(-)
DEW SENSOR
TO CP-1 (SV-A) CN302
MI-80065/FA4Q-USY2

AUDIO CIRCUIT

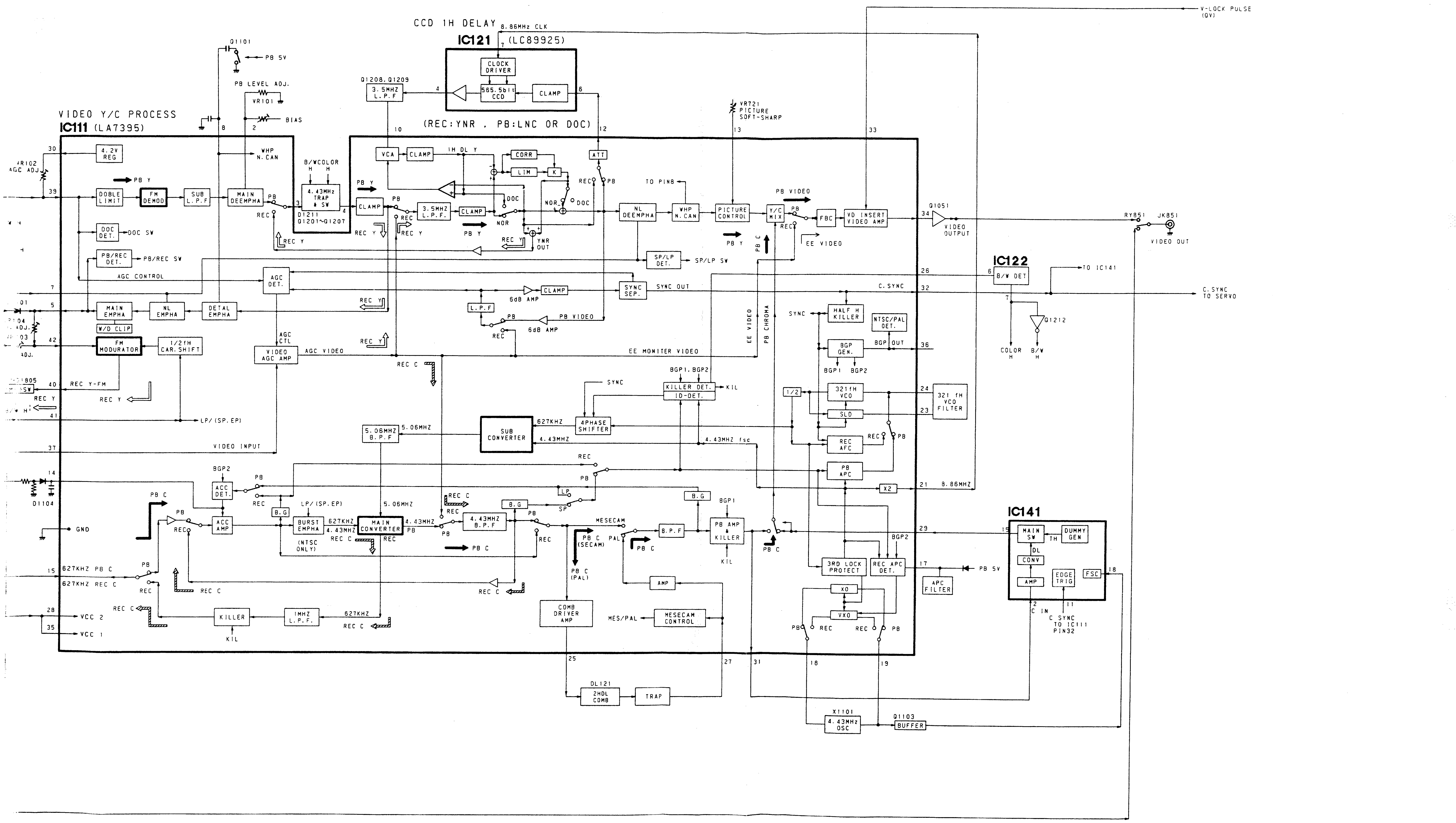


JK854
POWER:OFF
RY852
POWER:ON
AUDIO IN
IC851
MIC AMP
JK855
MIC IN
IC201 (LA7285M)
PB EQ AMP
REC EE
PB
EP
SP
12H
Q2012
R2001
(P)
(R)
BIAS
TP201
TP202
MECHANISM BLOCK
AUDIO R/P HEAD
PB EQ & LEVEL
SW
Q2010
BUF
LINE
TU
MUTE
ALC
ALC DET
C2009, R2009
ATTACK RECOVERY TIME CR
LINE AMP
R2010, R2011
ALC LEVEL
JK853
AUDIO OUTPUT
AUDIO OUTPUT (TO JK853)
A MUTE
Q2052
MUTE ON/OFF
LINE/TU/PB CONTROL
LINE:H TU:M PB:L
INV
Q2004
PB H (TO SV-A)
R2012, R2013
REC LEVEL
REC AMP
VR201 CURRENT BIAS ADJ
T2001
Q2001
70kHz OSC
AUDIO E HEAD
FULL E HEAD
PEAKING
C2073
LP
Q2011
EP/LP/SP CONTROL
REC/EE CONTROL
RIPPLE FILTER
24 H / 12 H TO SV-A
Q2003
Q2002
REC H (TO SV-A)
SWD 12V
REC 12V DET (TO SV-A)
BDA1-80034/FE4Q-EXSY

VIDEO CIRCUIT


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
HEAD DRUM
CH1
SUB HEAD
CH2
R.T
CH2
MAIN HEAD
CH1
PRE AMP UNIT.
IC181 (LA7374) VIDEO PRE.AMP
AMP
SW
REC:ON
PB:OFF
VCC
ENV DET
COMP
AGC AMP
AGC DET.
RF SW P
H AMP SW
ENV.SW.
Q1831 BUFFER
Y-FM
PB Y
Q1832~Q1835
EQ AMP & SW
B/W H
RF. ENVELOPE OUT
ENV.OUT
Q1262
REC H
REC/PB DET.
R/P SW
TP182
ENV.
H AMP SW
RF SW P
TP183
RF SW P
VCC
SWD 5V
LP CURRENT AMP
Y/C MIX AMP
REC:OFF
PB:ON
SP CURRENT AMP
SPEC H
Q1806
ATT.
TP181
REC CURRENT CHECK
Q1263
Q1264
CHROMA L.P.F
PB C
REC C
Q1261 BUF
VR181 REC C
VR102 AGC ADJ
SWD 5V
PB 5V
D1101
VR104 DEV.ADJ.
VR103
CARRIA ADJ.
VR182 REC Y
VR182 RELY
Q1801~Q1805
EQ AMP&SW
REC Y
B/W H'
ROTARY
B/W H
D1104
GND
SWD 5V
VIDEO Y/C PROCESS
IC111 (LA7395)
4.2V REG
DOBLE LIMIT
FM DEMOD
SUB L.P.F
MAIN DEEMPHA
WHP N.CAN
DOC DET.
DOC SW
PB/REC DET.
PB/REC SW
AGC CONTROL
MAIN EMPHA
W/D CLIP
NL EMPHA
DETAL EMPHA
FM MODURATOR
1/2fH CAR.SHIFT
REC Y-FM
LP/(SP.EP)
VIDEO INPUT
AGC DET.
AGC CTL
VIDEO AGC AMP
AGC VIDEO
Q1101
PB 5V
PB LEVEL ADJ.
VR101
BIAS
B/WCOLOR
4.43MHz TRAP & SW
Q1211
Q1201~Q1207
CLAMP
3.5MHZ L.P.F.
NOR
DOC
CCD 1H DELAY
8.86MHz CLK
IC121 (LC89925)
CLOCK DRIVER
565.5bit CCD
Q1208.Q1209
3.5MHZ L.P.F
(REC:YNR . PB:LNC OR DOC)
VCA
1H DL Y
CORR
LIM
K
ATT
YNR OUT
NL DEEMPHA
WHP N.CAN
PICTURE CONTROL
TO PIN8
SP/LP DET.
SP/LP SW
SYNC SEP.
SYNC OUT
6dB AMP
L.P.F
PB VIDEO
EE MONITER VIDEO
EE VIDEO
VR721 PICTU SOFT-
BGP1, BGP2
KILLER DET.
ID-DET.
KIL
SYNC
4PHASE SHIFTER
627KHZ
SUB CONVERTER
4.43MHZ
5.06MHZ B.P.F
5.06MHZ
4.43MHZ fsc
BGP2
ACC DET.
ACC AMP
B.G
BURST EMPHA
LP/(SP.EP)
(NTSC ONLY)
MAIN CONVERTER
4.43MHZ B.P.F
MESECAM
PB C (SECAM)
PB C (PAL)
PAL
B.P.F
BGP1
PB AMP & KILLER
AMP
MESECAM CONTROL
MES/PAL
COMB DRIVER AMP
DL121
2HOL COMB
TRAP
627KHZ PB C
627KHZ REC C
KILLER
1MHZ L.P.F
VCC 2
VCC 1
IC101
ONSCREEN DISPLAY
CV IN
CV OUT
SYNC IN
CS
CLK
SIN
OSD CS
OSD CLK
OSD DATA
TO SV-A
Q1052~Q1055
AMP
CLAMP
Q1003
Q1004~Q1005
BUF
VIDEO INPUT
JK852
RY851
VIDEO IN
IC122
C SYNC GENE.
C SYNC TO IC111 PIN32

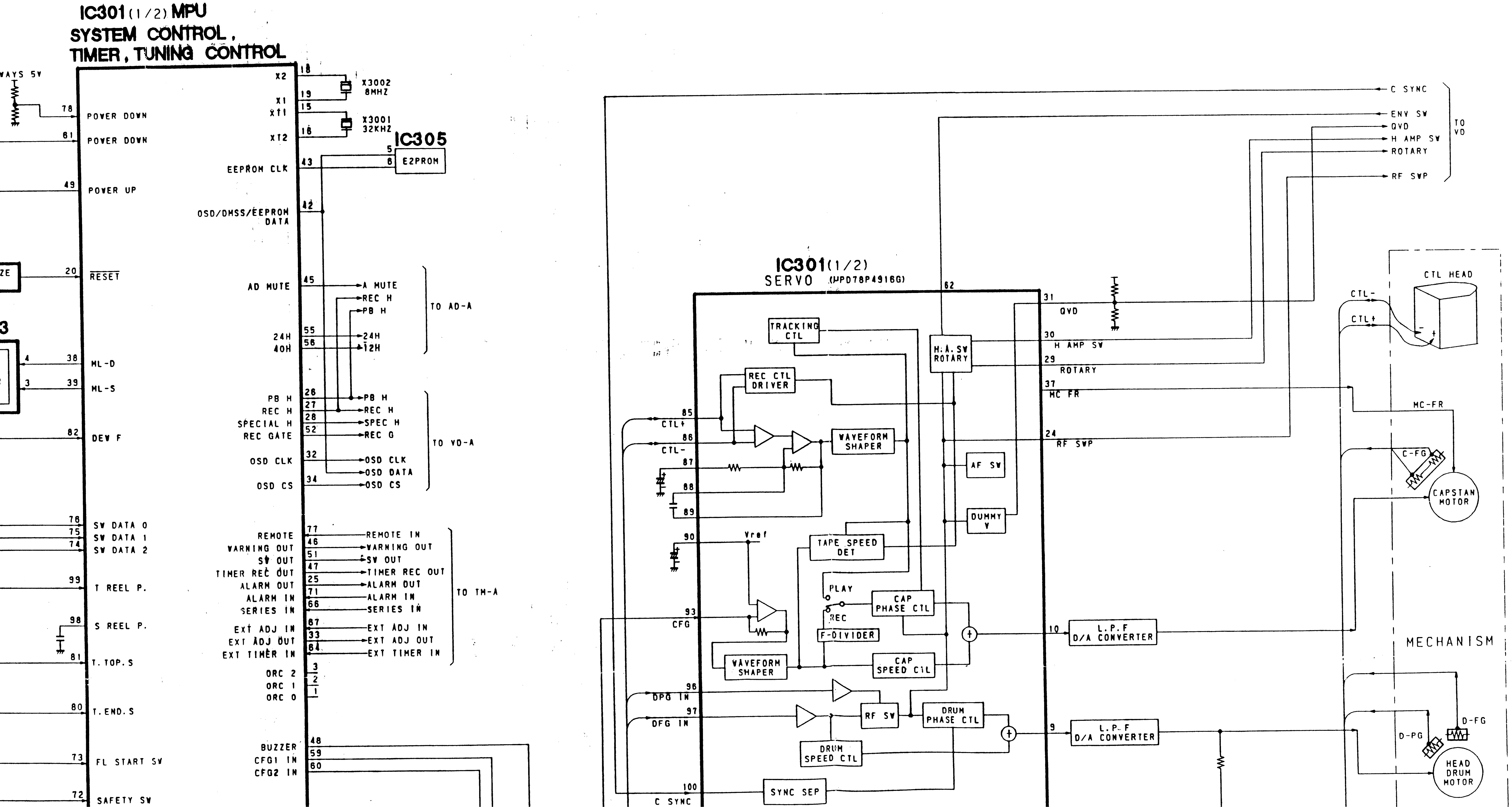
VIDEO CIRCUIT


CCD 1H DELAY
IC121 (LC89925)
8.86MHz CLK
CLOCK DRIVER
585.5bit CCD
CLAMP
Q1208.Q1209
3.5MHZ L.P.F
(REC:YNR . PB:LNC OR DOC)
V-LOCK PULSE (QV)
Q1101
PB 5V
PB LEVEL ADJ.
VR101
BIAS
VIDEO Y/C PROCESS
IC111 (LA7395)
VR102 AGC ADJ.
4.2V REG
WHP N.CAN
B/W COLOR
DOBLE LIMIT
FM DEMOD
SUB L.P.F
MAIN DEEMPHA
4.43MHz TRAP & SW
D1211 Q1201~Q1207
PB Y
REC Y
DOC DET.
DOC SW
PB/REC DET.
PB/REC SW
AGC CONTROL
AGC DET.
MAIN EMPHA
NL EMPHA
DETAL EMPHA
W/D CLIP
FM MODURATOR
1/2fH CAR. SHIFT
AGC CTL
VIDEO AGC AMP
AGC VIDEO
REC Y-FM
LP/(SP.EP)
VIDEO INPUT
VCA
CLAMP
1H DL Y
CORR
LIM
K
3.5MHZ L.P.F.
NOR
DOC
YNR OUT
ATT
L.P.F
6dB AMP
PB VIDEO
SYNC SEP.
SYNC OUT
SP/LP DET.
SP/LP SW
NL DEEMPHA
WHP N.CAN
TO PIN8
VR721 PICTURE SOFT-SHARP
PICTURE CONTROL
Y/C MIX
FBC
VD INSERT VIDEO AMP
EE VIDEO
EE VIDEO
PB CHROMA
EE MONITER VIDEO
Q1051
VIDEO OUTPUT
RY851
JK851
VIDEO OUT
IC122
B/W DET
TO IC141
C.SYNC
C.SYNC TO SERVO
Q1212
COLOR H
B/W H
HALF H KILLER
NTSC/PAL DET.
BGP GEN.
BGP OUT
BGP1
BGP2
KILLER DET.
ID-DET.
KIL
SYNC
4PHASE SHIFTER
627KHZ
4.43MHZ
SUB CONVERTER
5.06MHZ B.P.F
5.06MHZ
1/2
321fH VCO
SLD
321 fH VCO FILTER
REC AFC
PB APC
X2
8.86MHZ
4.43MHZ fsc
ACC DET.
ACC AMP
B.G
LP
SP
BURST EMPHA
(NTSC ONLY)
MAIN CONVERTER
4.43MHZ B.P.F
MESECAM
PB C
PB C (SECAM)
PB C (PAL)
PAL
B.P.F
PB AMP & KILLER
AMP
MESECAM CONTROL
MES/PAL
COMB DRIVER AMP
3RD LOCK PROTECT
REC APC DET.
XO
VXO
APC FILTER
PB 5V
IC141
MAIN SW
DUMMY GEN
TH
DL
CONV
AMP
EDGE TRIG
FSC
C IN
C SYNC TO IC111 PIN32
D1104
GND
627KHZ PB C
627KHZ REC C
VCC 2
VCC 1
KILLER
1MHZ L.P.F.
627KHZ
REC C
DL121
2HDL COMB
TRAP
X1101
4.43MHz OSC
Q1103
BUFFER

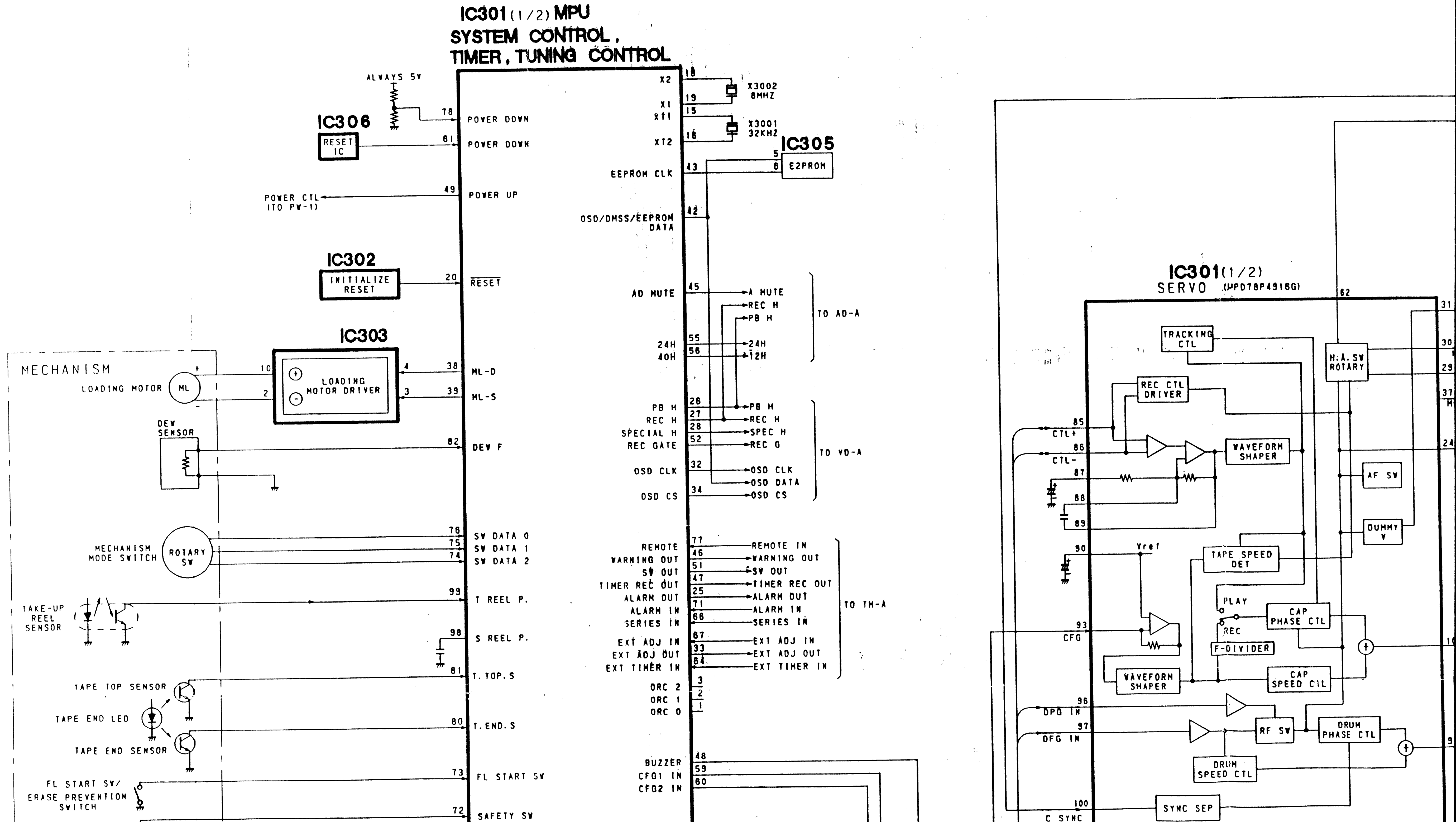
8DV1-80085/FE4Q-EX

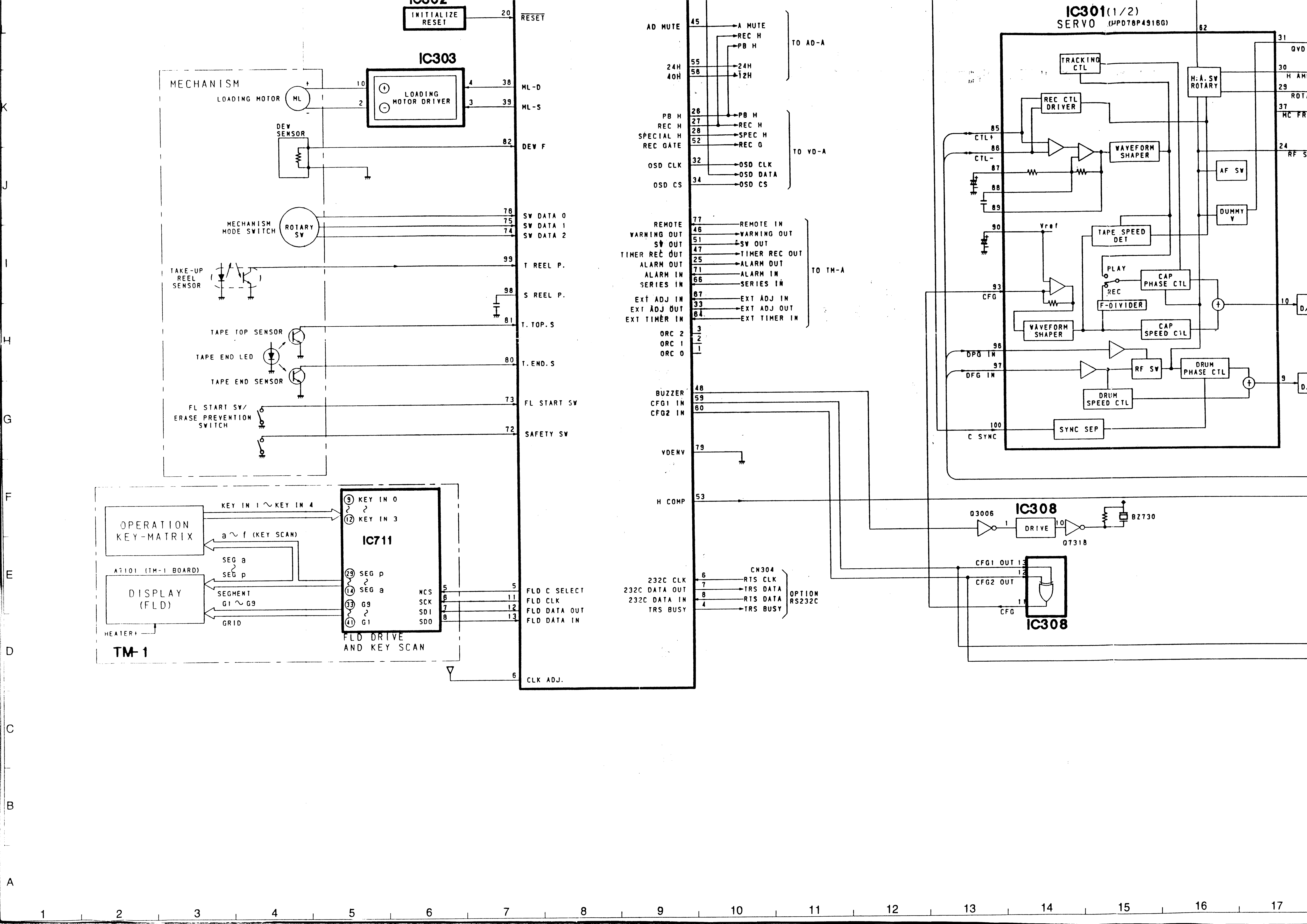
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

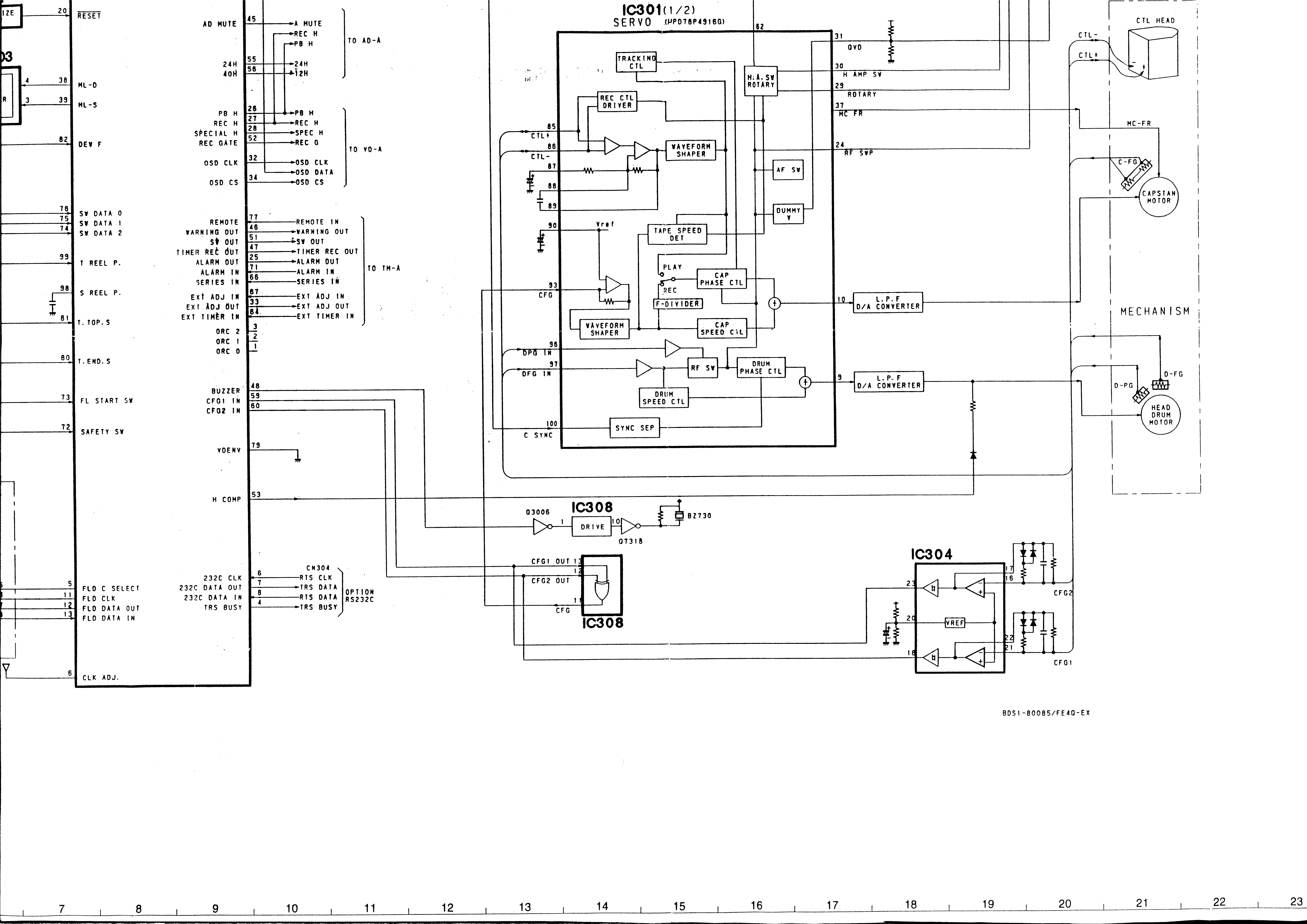
SYSTEM CONTROL & SERVO CIRCUIT


IC301(1/2) MPU
SYSTEM CONTROL,
TIMER, TUNING CONTROL
WAYS 5V
78 POWER DOWN
81 POWER DOWN
49 POWER UP
20 RESET
38 ML-D
39 ML-S
82 DEV F
76 SW DATA 0
75 SW DATA 1
74 SW DATA 2
99 T REEL P.
98 S REEL P.
81 T.TOP.S
80 T.END.S
73 FL START SW
72 SAFETY SW
X2 18
X1 19
XT1 15
XT2 16
X3002 8MHZ
X3001 32KHZ
IC305
E2PROM
EEPROM CLK 43
OSD/DMSS/EEPROM DATA 42
AD MUTE 45
24H 55
40H 56
A MUTE
REC H
PB H
24H
12H
TO AD-A
PB H 26
REC H 27
SPECIAL H 28
REC GATE 52
OSD CLK 32
OSD CS 34
PB H
REC H
SPEC H
REC G
OSD CLK
OSD DATA
OSD CS
TO VD-A
REMOTE 77
WARNING OUT 46
SW OUT 51
TIMER REC OUT 47
ALARM OUT 25
ALARM IN 71
SERIES IN 66
EXT ADJ IN 67
EXT ADJ OUT 33
EXT TIMER IN 64
ORC 2 3
ORC 1 2
ORC 0 1
REMOTE IN
WARNING OUT
SW OUT
TIMER REC OUT
ALARM OUT
ALARM IN
SERIES IN
EXT ADJ IN
EXT ADJ OUT
EXT TIMER IN
TO TM-A
BUZZER 48
CFG1 IN 59
CFG2 IN 60
C SYNC
ENV SW
QVD
H AMP SW
ROTARY
RF SWP
TO VD
IC301(1/2)
SERVO (μPD78P4916G)
62
TRACKING CTL
REC CTL DRIVER
WAVEFORM SHAPER
H.A.SW ROTARY
AF SW
DUMMY V
TAPE SPEED DET
PLAY
REC
CAP PHASE CTL
F-DIVIDER
CAP SPEED CTL
WAVEFORM SHAPER
Vref
RF SW
DRUM PHASE CTL
DRUM SPEED CTL
SYNC SEP
85 CTL+
86 CTL-
87
88
89
90
93 CFG
96 DPG IN
97 DFG IN
100 C SYNC
31 QVD
30 H AMP SW
29 ROTARY
37 MC FR
24 RF SWP
10 L.P.F D/A CONVERTER
9 L.P.F D/A CONVERTER
CTL HEAD
CTL-
CTL+
MC-FR
C-FG
CAPSTAN MOTOR
MECHANISM
D-FG
D-PG
HEAD DRUM MOTOR

SYSTEM CONTROL & SERVO CIRCUIT


R
Q
P
O
N
M
L
K
J
I
H
G
IC301 (1/2) MPU
SYSTEM CONTROL,
TIMER, TUNING CONTROL
ALWAYS 5V
IC306
RESET IC
78
POWER DOWN
81
POWER DOWN
POWER CTL
(TO PW-1)
49
POWER UP
IC302
INITIALIZE RESET
20
RESET
IC303
LOADING MOTOR DRIVER
10
2
4
3
38
ML-D
39
ML-S
MECHANISM
LOADING MOTOR
ML
+
-
DEW SENSOR
82
DEW F
MECHANISM MODE SWITCH
ROTARY SW
76
SW DATA 0
75
SW DATA 1
74
SW DATA 2
TAKE-UP REEL SENSOR
99
T REEL P.
98
S REEL P.
TAPE TOP SENSOR
81
T. TOP. S
TAPE END LED
TAPE END SENSOR
80
T. END. S
FL START SW/
ERASE PREVENTION SWITCH
73
FL START SW
72
SAFETY SW
X2
18
X1
19
XT1
15
XT2
16
X3002
8MHZ
X3001
32KHZ
IC305
E2PROM
5
6
EEPROM CLK
43
OSD/DMSS/EEPROM DATA
42
AD MUTE
45
A MUTE
REC H
PB H
24H
55
24H
40H
56
12H
TO AD-A
PB H
26
PB H
REC H
27
REC H
SPECIAL H
28
SPEC H
REC GATE
52
REC G
OSD CLK
32
OSD CLK
OSD DATA
OSD CS
34
OSD CS
TO VD-A
REMOTE
77
REMOTE IN
WARNING OUT
46
WARNING OUT
SW OUT
51
SW OUT
TIMER REC OUT
47
TIMER REC OUT
ALARM OUT
25
ALARM OUT
ALARM IN
71
ALARM IN
SERIES IN
66
SERIES IN
EXT ADJ IN
67
EXT ADJ IN
EXT ADJ OUT
33
EXT ADJ OUT
EXT TIMER IN
64
EXT TIMER IN
TO TM-A
ORC 2
3
ORC 1
2
ORC 0
1
BUZZER
48
CFG1 IN
59
CFG2 IN
60
IC301 (1/2)
SERVO (μPD78P4916G)
62
31
30
29
37
24
TRACKING CTL
H.A. SW ROTARY
REC CTL DRIVER
85
CTL+
86
CTL-
87
88
89
WAVEFORM SHAPER
AF SW
DUMMY V
90
Vref
TAPE SPEED DET
PLAY
REC
CAP PHASE CTL
F-DIVIDER
93
CFG
WAVEFORM SHAPER
CAP SPEED CTL
96
DPG IN
97
DFG IN
RF SW
DRUM PHASE CTL
DRUM SPEED CTL
100
C SYNC
SYNC SEP


IC302
INITIALIZE RESET
20 RESET
IC303
MECHANISM
LOADING MOTOR
ML
LOADING MOTOR DRIVER
10 2 4 3
38 ML-D
39 ML-S
DEW SENSOR
82 DEW F
MECHANISM MODE SWITCH
ROTARY SW
78 SW DATA 0
75 SW DATA 1
74 SW DATA 2
TAKE-UP REEL SENSOR
99 T REEL P.
98 S REEL P.
TAPE TOP SENSOR
81 T. TOP. S
TAPE END LED
TAPE END SENSOR
80 T. END. S
FL START SW/ ERASE PREVENTION SWITCH
73 FL START SW
72 SAFETY SW
OPERATION KEY-MATRIX
KEY IN 1 ~ KEY IN 4
a ~ f (KEY SCAN)
SEG a ~ SEG p
AT101 (TM-1 BOARD)
DISPLAY (FLD)
SEGMENT
G1 ~ G9
GRID
HEATER+
TM-1
IC711
⑨ KEY IN 0
⑫ KEY IN 3
㉙ SEG p
⑭ SEG a
㉝ G9
㊶ G1
NCS SCK SDI SDO
FLD DRIVE AND KEY SCAN
5 FLD C SELECT
11 FLD CLK
12 FLD DATA OUT
13 FLD DATA IN
6 CLK ADJ.
AD MUTE 45 A MUTE
REC H
PB H
24H 55 24H
40H 56 12H
TO AD-A
PB H 26 PB H
REC H 27 REC H
SPECIAL H 28 SPEC H
REC GATE 52 REC G
OSD CLK 32 OSD CLK
OSD DATA
OSD CS 34 OSD CS
TO VD-A
REMOTE 77 REMOTE IN
WARNING OUT 46 WARNING OUT
SW OUT 51 SW OUT
TIMER REC OUT 47 TIMER REC OUT
ALARM OUT 25 ALARM OUT
ALARM IN 71 ALARM IN
SERIES IN 66 SERIES IN
EXT ADJ IN 87 EXT ADJ IN
EXT ADJ OUT 33 EXT ADJ OUT
EXT TIMER IN 84 EXT TIMER IN
TO TM-A
ORC 2 3
ORC 1 2
ORC 0 1
BUZZER 48
CFG1 IN 59
CFG2 IN 60
VDENV 79
H COMP 53
232C CLK 6 RTS CLK
232C DATA OUT 7 TRS DATA
232C DATA IN 8 RTS DATA
TRS BUSY 4 TRS BUSY
CN304
OPTION RS232C
IC301(1/2)
SERVO (μPD78P4916G)
62
TRACKING CTL
H.A. SW ROTARY
31 QVD
30 H AM
29 ROT
37 HC FR
REC CTL DRIVER
85 CTL+
86 CTL-
87 88 89
WAVEFORM SHAPER
24 RF S
AF SW
DUMMY V
90 Vref
TAPE SPEED DET
PLAY
REC
CAP PHASE CTL
F-DIVIDER
93 CFG
10 D
WAVEFORM SHAPER
CAP SPEED CTL
96 DPG IN
97 DFG IN
RF SW
DRUM PHASE CTL
9 D
DRUM SPEED CTL
100 C SYNC
SYNC SEP
IC308
Q3006
1 DRIVE 10
Q7318
BZ730
CFG1 OUT 13
12
CFG2 OUT
11
CFG
IC308
L K J I H G F E D C B A
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17


IC301(1/2)
SERVO (μPD78P4916G)
TRACKING CTL
REC CTL DRIVER
WAVEFORM SHAPER
H.A.SW ROTARY
AF SW
DUMMY V
TAPE SPEED DET
CAP PHASE CTL
F-DIVIDER
CAP SPEED CTL
RF SW
DRUM PHASE CTL
DRUM SPEED CTL
SYNC SEP
Vref
PLAY
REC
CTL+
CTL-
CFG
DPG IN
DFG IN
C SYNC
QVD
H AMP SW
ROTARY
MC FR
RF SWP
L.P.F D/A CONVERTER
CTL HEAD
MC-FR
C-FG
CAPSTAN MOTOR
MECHANISM
D-FG
D-PG
HEAD DRUM MOTOR
IC308
Q3006
DRIVE
Q7318
BZ730
CFG1 OUT
CFG2 OUT
IC304
VREF
CFG2
CFG1
RESET
ML-D
ML-S
DEV F
SW DATA 0
SW DATA 1
SW DATA 2
T REEL P.
S REEL P.
T.TOP.S
T.END.S
FL START SW
SAFETY SW
FLD C SELECT
FLD CLK
FLD DATA OUT
FLD DATA IN
CLK ADJ.
AD MUTE
A MUTE
REC H
PB H
24H
40H
12H
TO AD-A
SPECIAL H
SPEC H
REC GATE
REC G
OSD CLK
OSD DATA
OSD CS
TO VD-A
REMOTE
REMOTE IN
WARNING OUT
SW OUT
TIMER REC OUT
ALARM OUT
ALARM IN
SERIES IN
EXT ADJ IN
EXT ADJ OUT
EXT TIMER IN
TO TM-A
ORC 2
ORC 1
ORC 0
BUZZER
CFG1 IN
CFG2 IN
VDENV
H COMP
232C CLK
232C DATA OUT
232C DATA IN
TRS BUSY
CN304
RTS CLK
TRS DATA
RTS DATA
OPTION RS232C
7
8
9
10
11
12
13
14
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16
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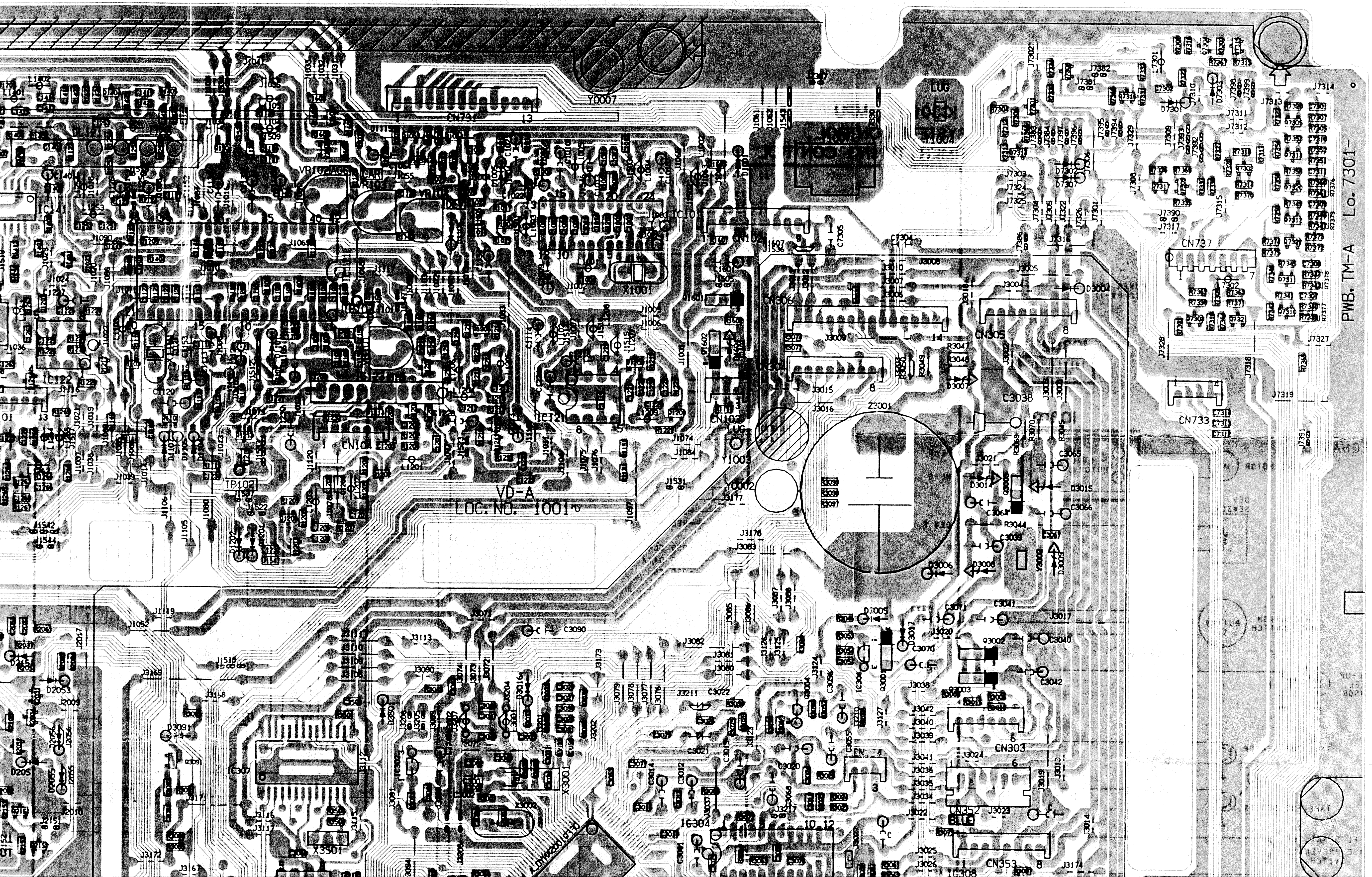
22
23

BDS1-80085/FE4Q-EX

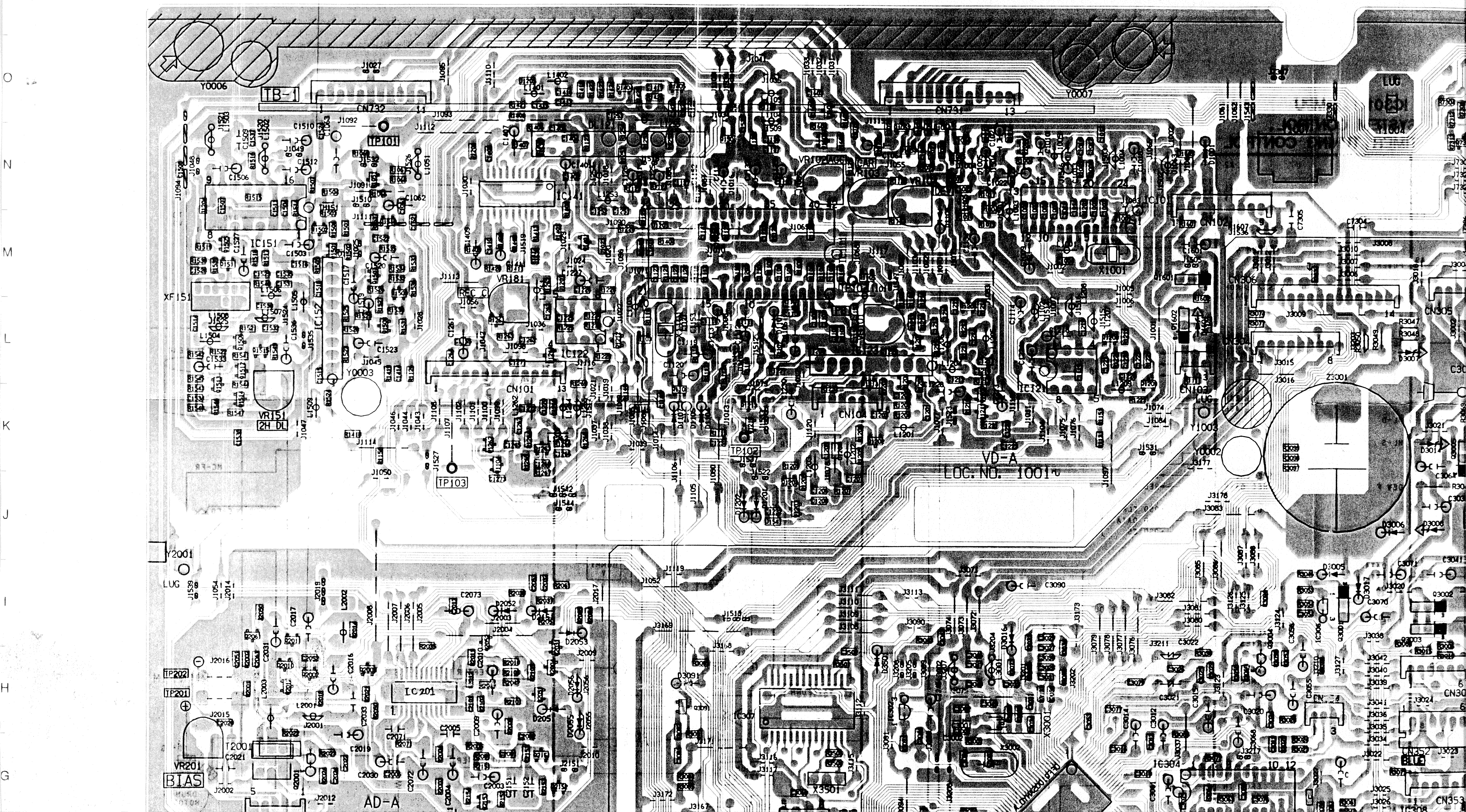
W.B.)

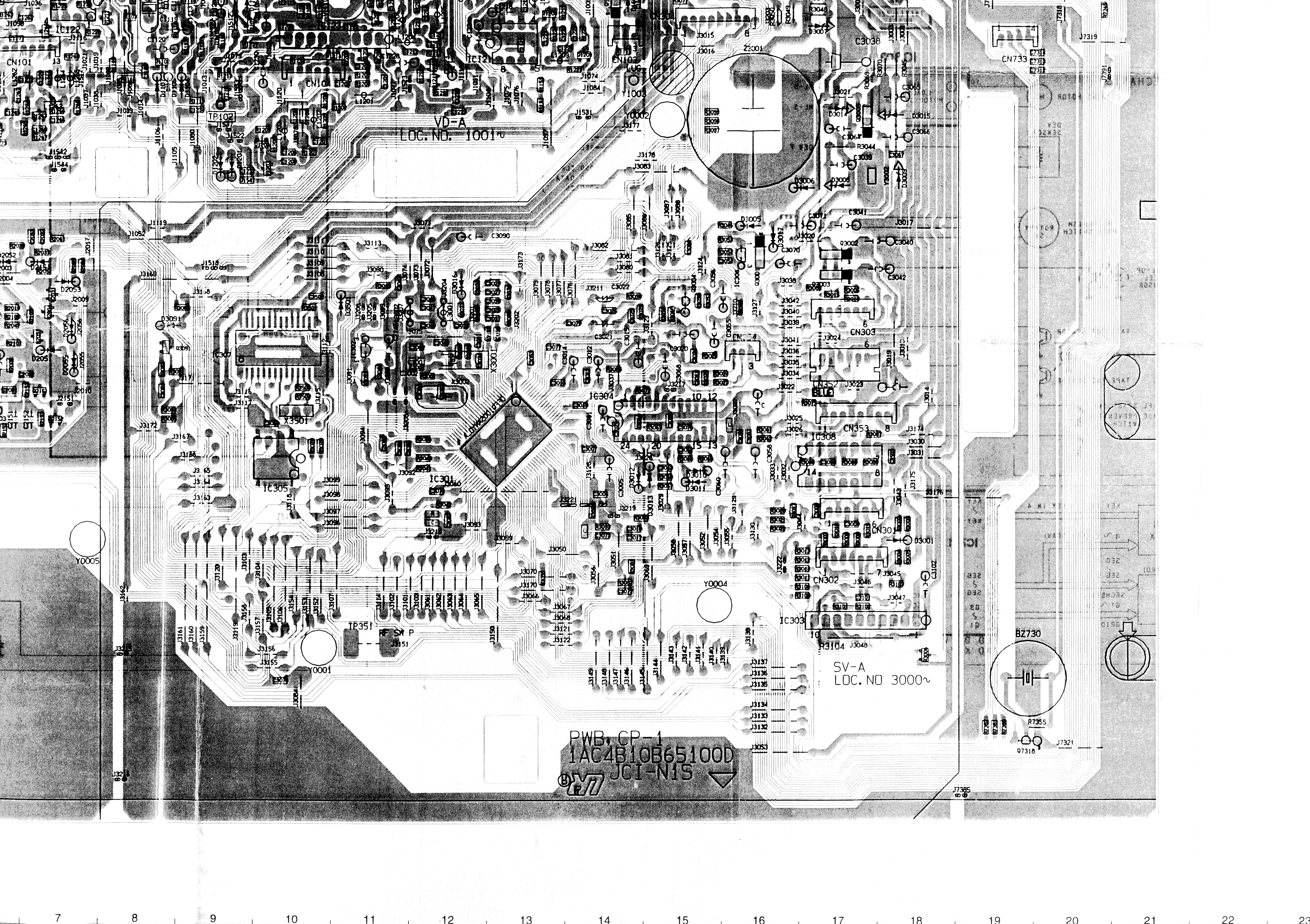
CP-1 P.W.B.

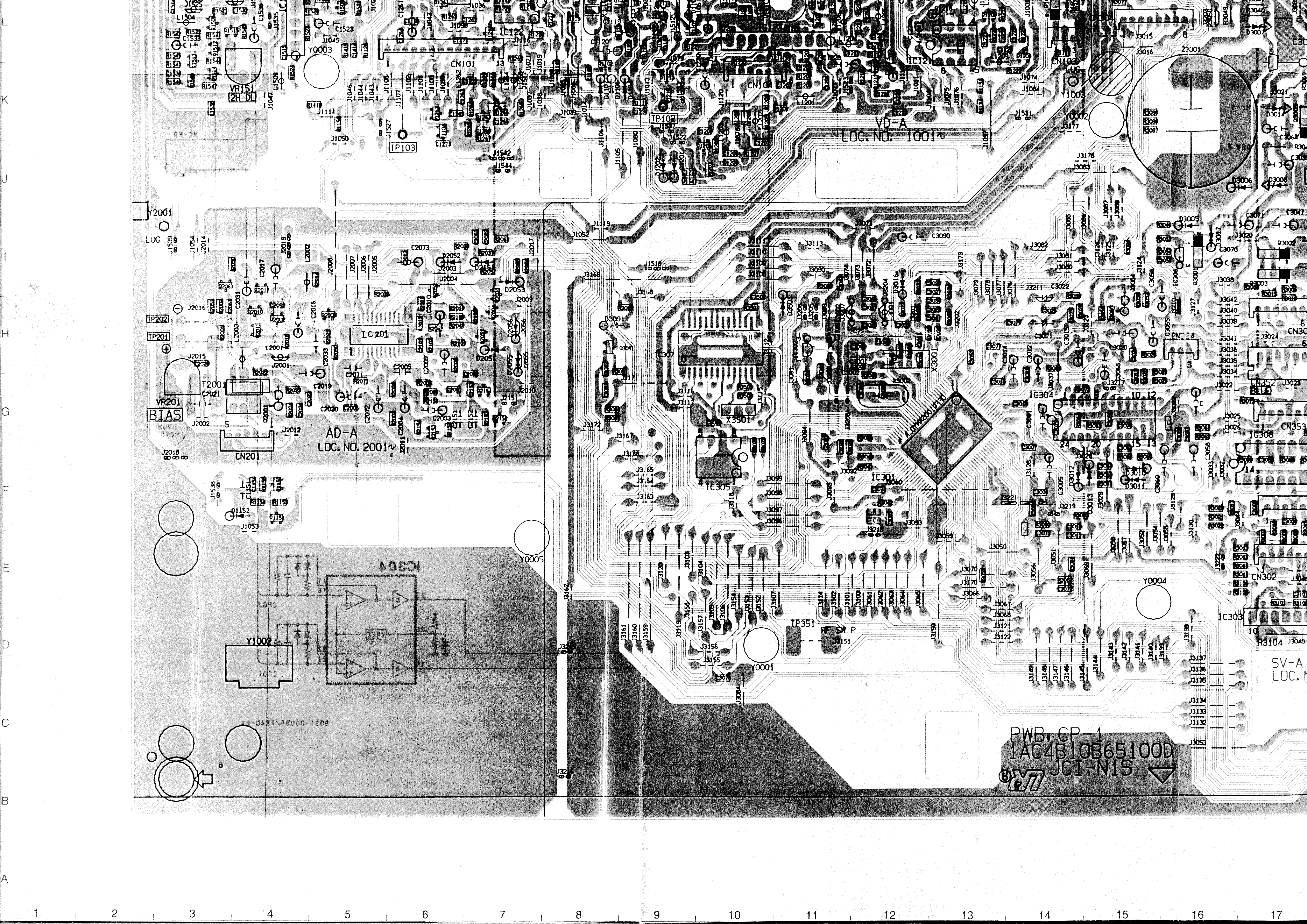

PWB. TM-A Lo. 7301-
VD-A
LOC. NO. 1001
Y0007
Y1003
Y0002
X1001
X3001
X3501
Z3001
CN737
CN733
CN305
CN306
CN303
CN352
CN353
CN104
CN103
IC121
IC122
IC304
IC307
IC308
TP102
LUG
C3038
D3004
J7314
J7327
J7319

2. CIRCUIT DIAGRAMS & PRINTED WIRING BOARDS (P.W.B.)

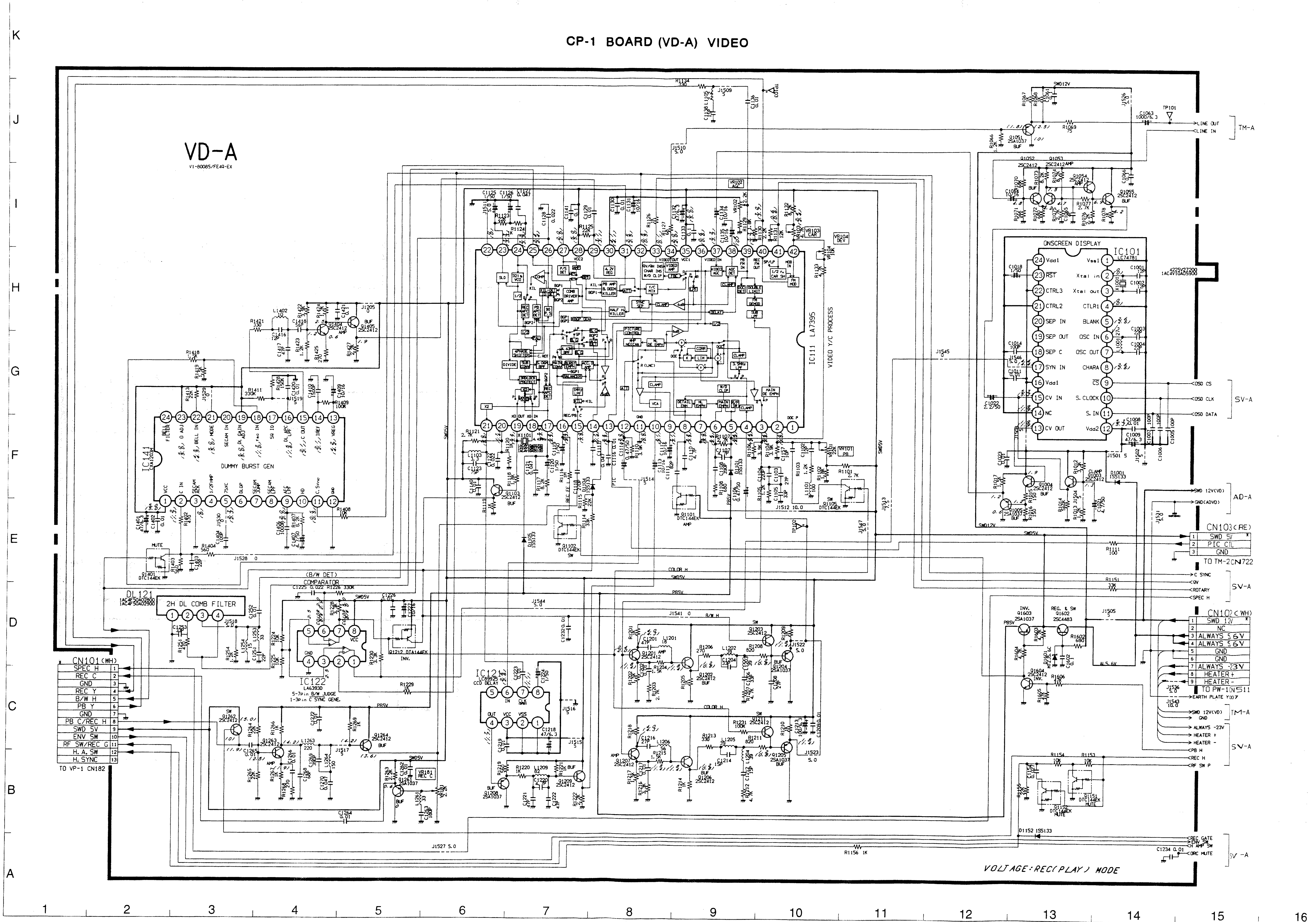
CP-1 P.W.B.


R
Q
P
O
N
M
L
K
J
I
H
G
Y0006
TB-1
CN732
J1027
TP101
IC151
IC152
XF151
VR151
2H DL
Y0003
VR181
REC C
IC141
IC122
CN101
TP103
TP102
CN104
VR102
VR103
IC101
X1001
Y0007
CN731
LUG
IC301
CN102
CN306
CN305
CN304
CN103
IC121
Y1003
Y0002
VD-A
LOG. NO. 1001
Y2001
LUG
TP202
TP201
VR201
BIAS
T2001
IC201
AD-A
IC307
X3501
X3001
IC304
CN352
CN353

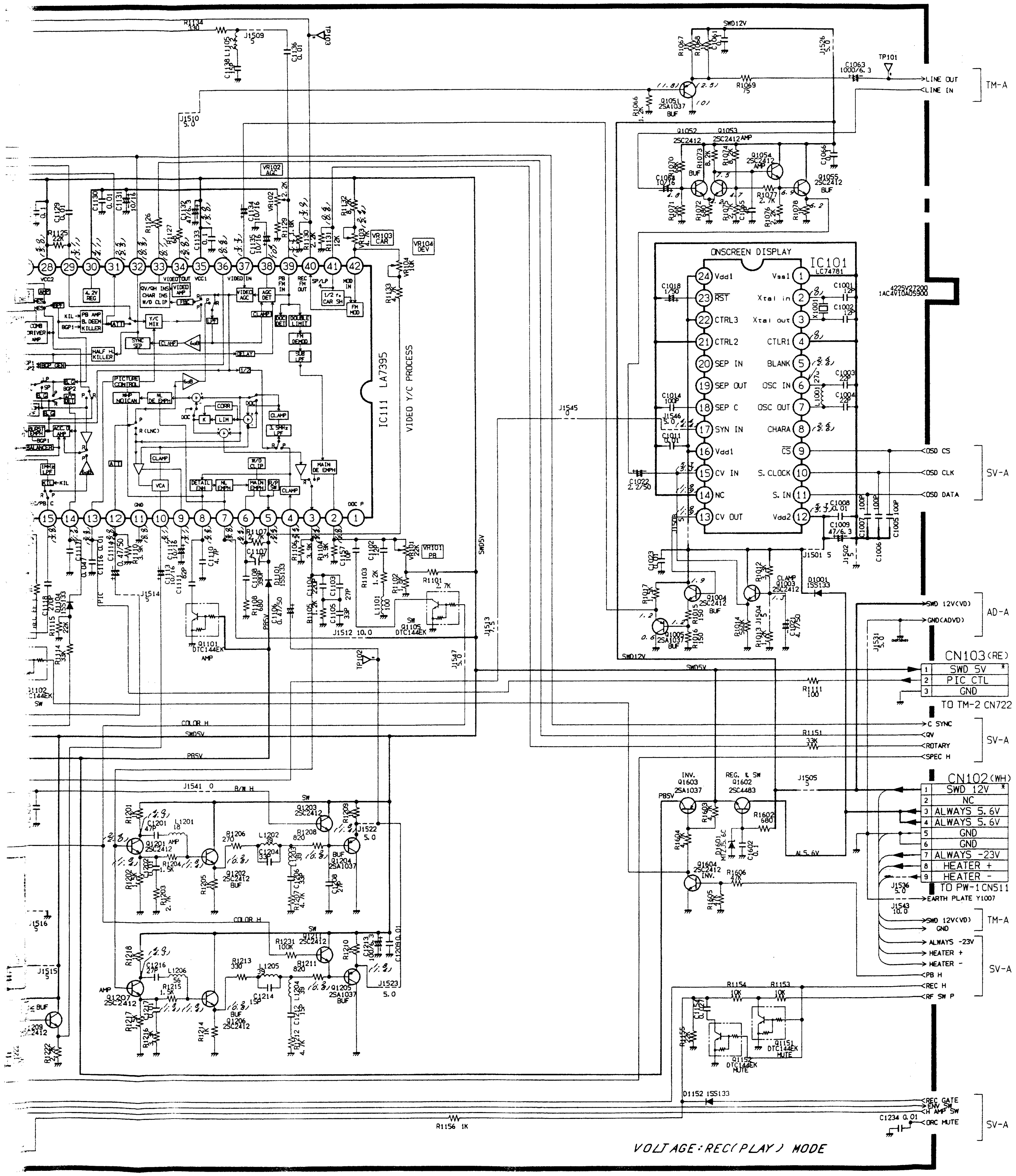

VD-A
LOC. NO. 1001~
SV-A
LOC.NO 3000~
PWB, CP-1
1AC4B10B65100D
JCI-N1S
IC301
IC303
IC304
IC305
IC307
IC308
IC121
IC122
CN101
CN102
CN104
CN301
CN302
CN303
CN352
CN353
CN733
X3001
X3002
X3501
Y0001
Y0002
Y0004
Y0005
Y1003
Z3001
BZ730
TP102
TP351
RF SW P
R3104
R7355
Q7318
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23


VD-A
LOC. NO. 1001~
AD-A
LOC. NO. 2001~
SV-A
LOC. N
PWB, CP-1
1AC4B10B65100D
JCI-N1S
IC201
IC301
IC303
IC304
IC305
IC307
IC308
IC121
IC122
CN101
CN102
CN104
CN201
CN302
CN352
CN353
VR151
2H DL
VR201
BIAS
T2001
TP103
TP102
TP201
TP202
TP351
RF SW P
X3001
X3501
Y0001
Y0002
Y0003
Y0004
Y0005
Y1002
Y1003
Y2001
LUG
Z3001
L
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

CP-1 BOARD (VD-A) VIDEO

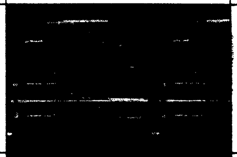
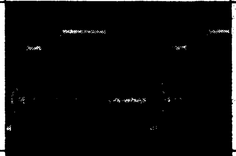
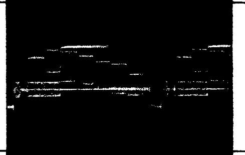
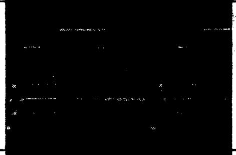
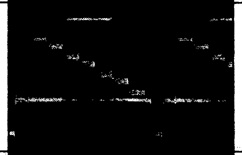
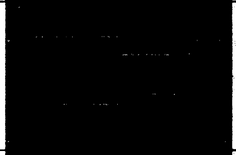
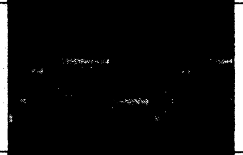
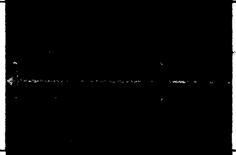
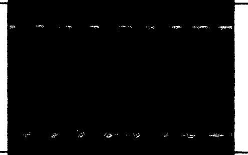
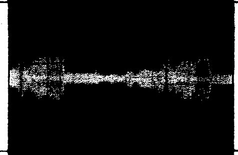
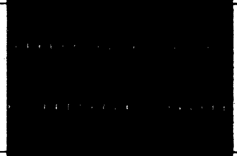
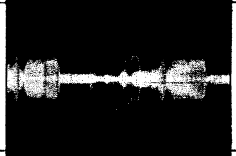
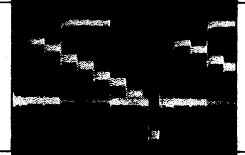
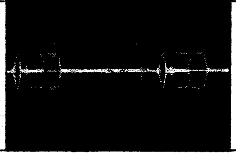
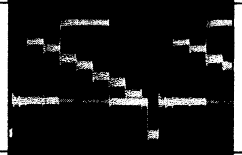
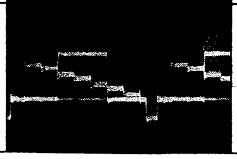

VD-A
V1-80085/FE40-EX
IC111 LA7395 VIDEO Y/C PROCESS
ONSCREEN DISPLAY
IC101 LC74781
IC141 LA7201
DUMMY BURST GEN
DL121 1AC4F50A02800 1AC4F50A02900
2H DL COMB FILTER
IC122 LA6393D
5-7pin B/W JUDGE
1-3pin C SYNC GENE.
(B/W DET) COMPARATOR
IC121 LC89925 CCD DELAY
CN101 (WH)
1 SPEC H
2 REC C
3 GND
4 REC Y
5 B/W H
6 PB Y
7 GND
8 PB C/REC H
9 SWD 5V
10 ENV SW
11 RF SW/REC G
12 H. A. SW
13 H. SYNC
TO VP-1 CN182
CN103 (RE)
1 SWD 5V
2 PIC CTL
3 GND
TO TM-2 CN722
CN102 (WH)
1 SWD 12V
2 NC
3 ALWAYS 5.6V
4 ALWAYS 5.6V
5 GND
6 GND
7 ALWAYS -23V
8 HEATER +
9 HEATER -
TO PW-1 CN511
LINE OUT
LINE IN
TM-A
OSD CS
OSD CLK
OSD DATA
SV-A
SWD 12V(VD)
GND(ADVD)
AD-A
C SYNC
CV
ROTARY
SPEC H
EARTH PLATE Y007
SWD 12V(VD)
GND
ALWAYS -23V
HEATER +
HEATER -
PB H
REC H
RF SW P
REC GATE
ENV SW
CH AMP SW
DRC MUTE
SV-A
VOLTAGE: REC(PLAY) MODE
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

P-1 BOARD (VD-A) VIDEO

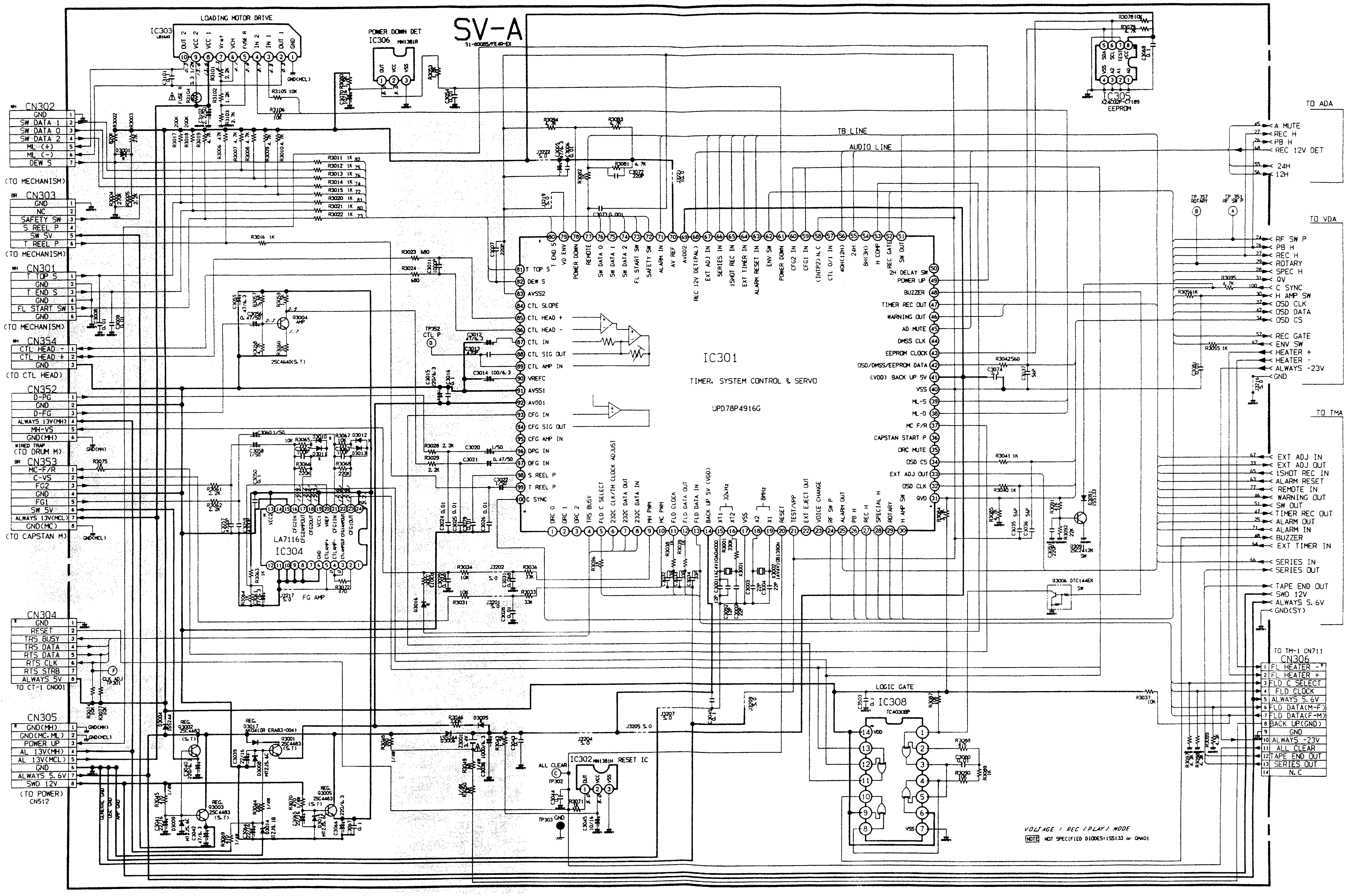

IC111 LA7395
VIDEO Y/C PROCESS
IC101 LC74781
ONSCREEN DISPLAY
Vdd1
RST
CTRL3
CTRL2
SEP IN
SEP OUT
SEP C
SYN IN
CV IN
NC
CV OUT
Vss1
Xtal in
Xtal out
CTLR1
BLANK
OSC IN
OSC OUT
CHARA
CS
S.CLOCK
S.IN
Vdd2
LINE OUT
LINE IN
TM-A
TP101
OSD CS
OSD CLK
OSD DATA
SV-A
SWD 12V(VD)
GND(ADVD)
AD-A
CN103(RE)
SWD 5V
PIC CTL
GND
TO TM-2 CN722
C SYNC
CW
ROTARY
SPEC H
CN102(WH)
SWD 12V
NC
ALWAYS 5.6V
ALWAYS 5.6V
GND
GND
ALWAYS -23V
HEATER +
HEATER -
TO PW-1 CN511
EARTH PLATE Y1007
SWD 12V(VD)
GND
ALWAYS -23V
HEATER +
HEATER -
PB H
REC H
RF SW P
REC GATE
CH AMP SW
DRC MUTE
COLOR H
SWD5V
PBSV
B/W H
Q1051 2SA1037 BUF
Q1052 2SC2412
Q1053 2SC2412 AMP
Q1054 2SC2412 AMP
Q1055 2SC2412 BUF
Q1201 2SC2412 AMP
Q1202 2SC2412 BUF
Q1203 2SC2412 SW
Q1204 2SA1037 BUF
Q1205 2SA1037 BUF
Q1206 2SC2412
Q1207 2SC2412 AMP
Q1601 2SC4483
Q1602 2SC4483 REG. & SW
Q1603 2SA1037 INV.
Q1604 2SC2412 INV.
Q1101 DTC144EK AMP
Q1105 DTC144EK
Q1151 DTC144EK MUTE
Q1152 DTC144EK MUTE
D1152 1SS133
VR1101 PB
VR1102 AGC
VR1103 CAR
VR1104 DEV
R1134 330
R1156 1K
R1111 100
R1151 33K
R1154 10K
R1153 10K
C1234 0.01
VOLTAGE: REC(PLAY) MODE

VIDEO CIRCUIT WAVEFORMS

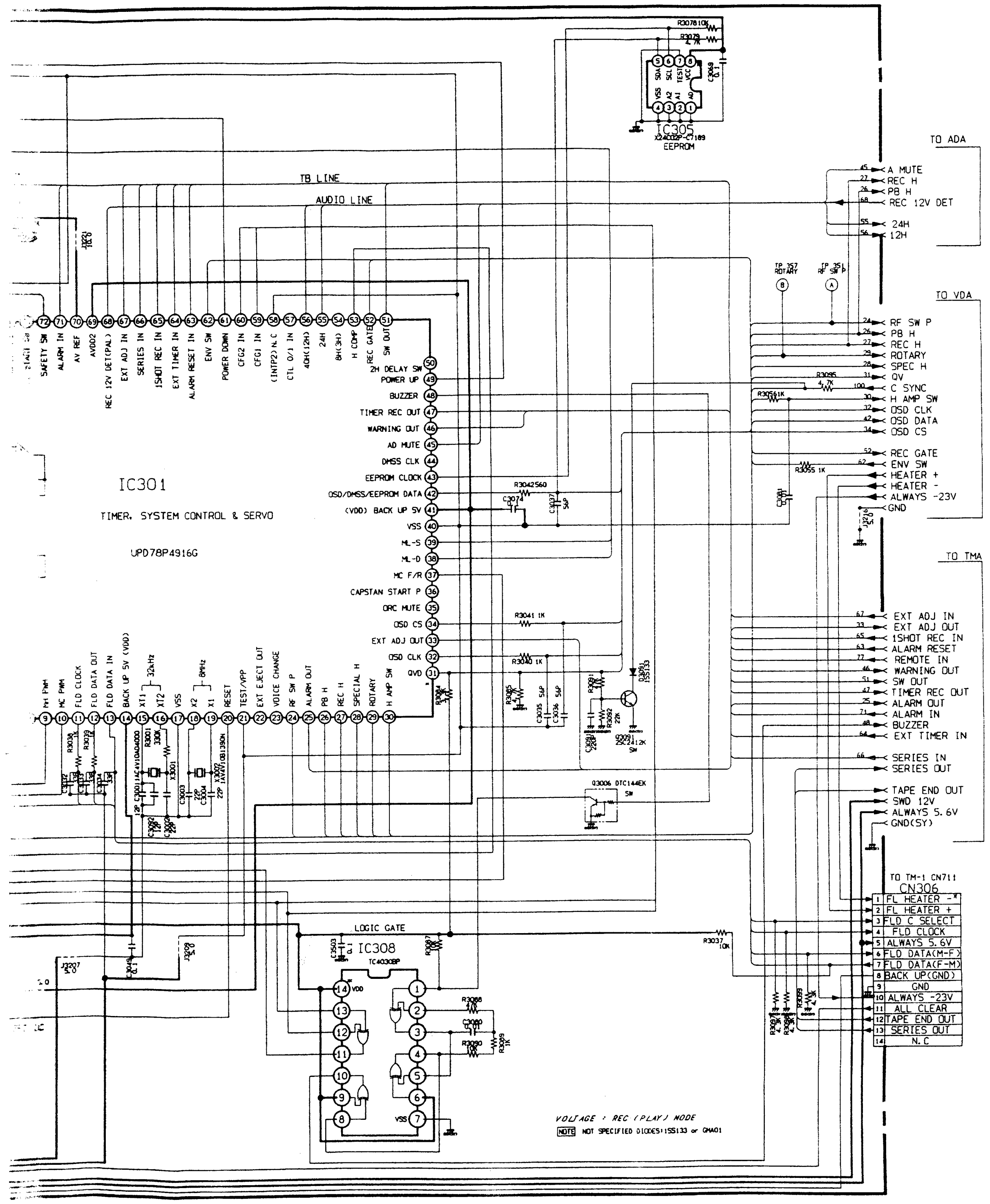
WF-V-EA

TEST LOCATION	WAVEFORM	MODE/LEVEL	TEST LOCATION	WAVEFORM	MODE/LEVEL
IC111 Pin 37		REC, EE 1 Vp-p	IC111 Pin 34		PB 2 Vp-p
IC111 Pin 3		REC, EE 0.6 Vp-p	IC111 Pin 34		REC, EE 2 Vp-p
IC111 Pin 4		REC, EE 0.5 Vp-p	IC111 (UPPER) Pin 34 (LOWER) Pin 33		STILL (UPPER) 2 Vp-p (LOWER) 5 Vp-p
IC111 Pin 5		REC, EE 1.2 Vp-p	IC111 Pin 15		REC, EE 0.7 Vp-p
IC111 Pin 40		REC, EE 1.0 Vp-p	IC111 Pin 15		PB 0.25 Vp-p
IC111 Pin 39		PB 0.3 Vp-p	IC111 Pin 25		PB 1.0 Vp-p
IC111 Pin 3		PB 0.5 Vp-p	IC111 Pin 31		PB 0.6 Vp-p
IC111 Pin 4		PB 0.5 Vp-p			
IC111 Pins 10/12		PB 0.3 Vp-p			

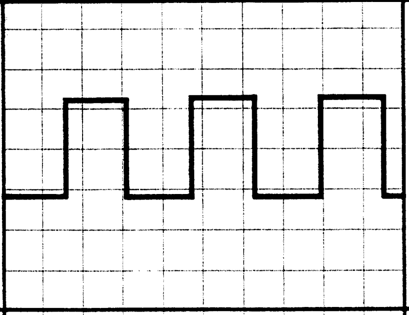
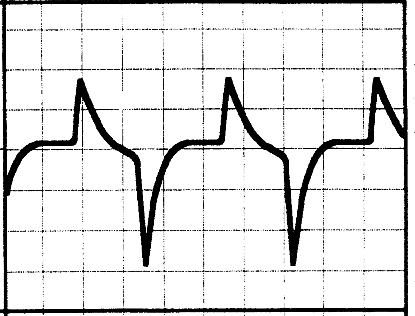
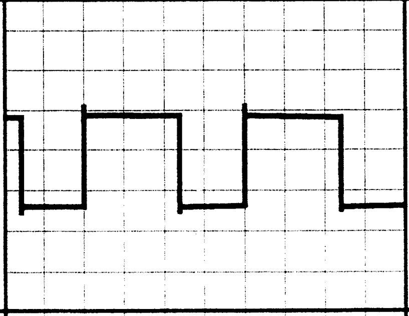
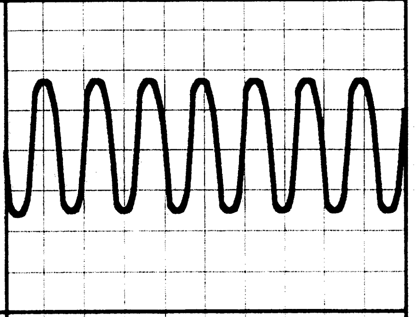
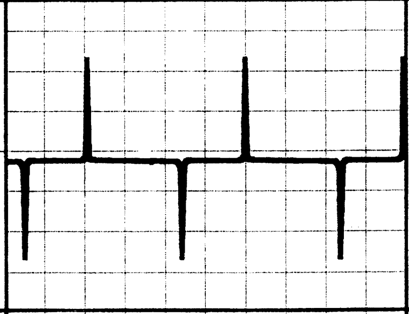
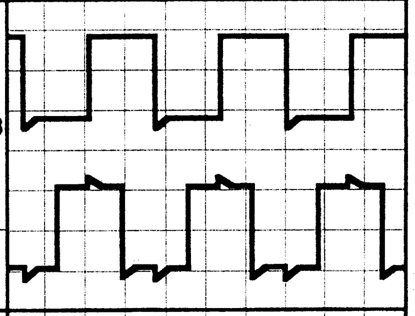
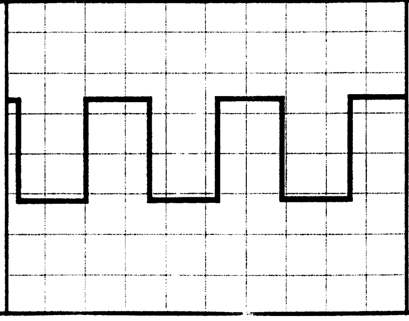
CP-1 BOARD (SV-A) SYSTEM CONTROL & SERVO


SV-A
LOADING MOTOR DRIVE
IC303
POWER DOWN DET
IC306
IC305
EEPROM
IC301
TIMER, SYSTEM CONTROL & SERVO
UPD78P4916G
LA7116
IC304
FG AMP
LOGIC GATE
IC308
IC302
RESET IC
TB LINE
AUDIO LINE
CN302
GND
SW DATA 1
SW DATA 0
SW DATA 2
ML (+)
ML (-)
DEW S
(TO MECHANISM)
CN303
GND
NC
SAFETY SW
S REEL P
SW 5V
T REEL P
(TO MECHANISM)
CN301
T TOP S
GND
T END S
GND
FL START SW
GND
(TO MECHANISM)
CN354
CTL HEAD -
CTL HEAD +
GND
(TO CTL HEAD)
CN352
D-PG
GND
D-FG
ALWAYS 13V(MH)
GND(MH)
MH-VS
GND(MH)
(TO DRUM M)
CN353
MC-F/R
C-VS
FG2
GND
FG1
SW 5V
ALWAYS 13V(MCL)
GND(MC)
(TO CAPSTAN M)
CN304
GND
RESET
TRS BUSY
TRS DATA
RTS DATA
RTS CLK
RTS STRB
ALWAYS 5V
GND
TO CT-1 CN001
CN305
GND(MH)
GND(MC,ML)
POWER UP
AL 13V(MH)
AL 13V(MCL)
GND
ALWAYS 5.6V
SWD 12V
(TO POWER)
CN512
TO ADA
A MUTE
REC H
PB H
REC 12V DET
24H
12H
TO VDA
RF SW P
PB H
REC H
ROTARY
SPEC H
OV
C SYNC
H AMP SW
OSD CLK
OSD DATA
OSD CS
REC GATE
ENV SW
HEATER +
HEATER -
ALWAYS -23V
GND
TO TMA
EXT ADJ IN
EXT ADJ OUT
1SHOT REC IN
ALARM RESET
REMOTE IN
WARNING OUT
SW OUT
TIMER REC OUT
ALARM OUT
ALARM IN
BUZZER
EXT TIMER IN
SERIES IN
SERIES OUT
TAPE END OUT
SWD 12V
ALWAYS 5.6V
GND(SY)
TO TM-1 CN711
CN306
FL HEATER -
FL HEATER +
FLD C SELECT
FLD CLOCK
ALWAYS 5.6V
FLD DATA(M-F)
FLD DATA(F-M)
BACK UP(GND)
GND
ALWAYS -23V
ALL CLEAR
TAPE END OUT
SERIES OUT
N.C
T TOP S
DEW S
AVSS2
CTL SLOPE
CTL HEAD +
CTL HEAD -
CTL IN
CTL SIG OUT
CTL AMP IN
VREFC
AVSS1
AVDD1
CFG IN
CFG SIG OUT
CFG AMP IN
DPG IN
DFG IN
S REEL P
T REEL P
C SYNC
2H DELAY SW
POWER UP
BUZZER
TIMER REC OUT
WARNING OUT
AD MUTE
DMSS CLK
EEPROM CLOCK
OSD/DMSS/EEPROM DATA
(VDD) BACK UP 5V
VSS
ML-S
ML-D
MC F/R
CAPSTAN START P
DRC MUTE
OSD CS
EXT ADJ OUT
OSD CLK
GVD
TRS BUSY
FLD C SELECT
22CC CLK/TH CLOCK ADJUST
22CC DATA OUT
22CC DATA IN
MH PWM
MC PWM
FLD CLOCK
FLD DATA OUT
FLD DATA IN
BACK UP 5V (VDD)
X2
X1
RESET
TEST/VPP
EXT EJECT OUT
VOICE CHANGE
RF SW P
ALARM OUT
PB H
REC H
SPECIAL H
ROTARY
H AMP SW
END S
VD ENV
POWER DOWN
REMOTE
SW DATA 0
SW DATA 1
SW DATA 2
FL START SW
SAFETY SW
ALARM IN
AV REF
AVDD2
REC 12V DET(PAL)
EXT ADJ IN
SERIES IN
1SHOT REC IN
EXT TIMER IN
ALARM RESET
ENV SW
POWER DOWN
CFG2 IN
CFG1 IN
CTL D/1 IN
24H
8H(3H)
H COMP
REC GATE
SW OUT
ALL CLEAR
VOLTAGE : REC (PLAY) MODE
NOTE NOT SPECIFIED DIODES:1SS133 or GMA01

SYSTEM CONTROL & SERVO


IC305
EEPROM
TO ADA
TB LINE
AUDIO LINE
A MUTE
REC H
PB H
REC 12V DET
24H
12H
TO VDA
RF SW P
PB H
REC H
ROTARY
SPEC H
0V
C SYNC
H AMP SW
OSD CLK
OSD DATA
OSD CS
REC GATE
ENV SW
HEATER +
HEATER -
ALWAYS -23V
GND
TO TMA
EXT ADJ IN
EXT ADJ OUT
1SHOT REC IN
ALARM RESET
REMOTE IN
WARNING OUT
SW OUT
TIMER REC OUT
ALARM OUT
ALARM IN
BUZZER
EXT TIMER IN
SERIES IN
SERIES OUT
TAPE END OUT
SWD 12V
ALWAYS 5.6V
GND(SY)
IC301
TIMER, SYSTEM CONTROL & SERVO
UPD78P4916G
SAFETY SW
ALARM IN
AV REF
AVDD2
REC 12V DET(PAL)
EXT ADJ IN
SERIES IN
1SHOT REC IN
EXT TIMER IN
ALARM RESET IN
ENV SW
POWER DOWN
CFG2 IN
CFG1 IN
CTL 0/1 IN
24H
H COMP
REC GATE
SW OUT
2H DELAY SW
POWER UP
BUZZER
TIMER REC OUT
WARNING OUT
AD MUTE
DMSS CLK
EEPROM CLOCK
OSD/DMSS/EEPROM DATA
(VDD) BACK UP 5V
VSS
ML-S
ML-O
MC F/R
CAPSTAN START P
ORC MUTE
OSD CS
EXT ADJ OUT
OSD CLK
QVD
FM PWM
MC PWM
FLD CLOCK
FLD DATA OUT
FLD DATA IN
BACK UP 5V (VDD)
XT1
XT2
VSS
X2
X1
RESET
TEST/VPP
EXT EJECT OUT
VOICE CHANGE
RF SW P
ALARM OUT
PB H
REC H
SPECIAL H
ROTARY
H AMP SW
32kHz
8MHz
Q3006 DTC144EK
LOGIC GATE
IC308
TC4030BP
VDD
VSS
TO TM-1 CN711
CN306
FL HEATER -
FL HEATER +
FLD C SELECT
FLD CLOCK
ALWAYS 5.6V
FLD DATA(M-F)
FLD DATA(F-M)
BACK UP(GND)
GND
ALWAYS -23V
ALL CLEAR
TAPE END OUT
SERIES OUT
N.C
VOLTAGE : REC (PLAY) MODE
NOTE NOT SPECIFIED DIODES:1SS133 or GMA01

SERVO CIRCUIT WAVEFORMS

TEST LOCATION	WAVEFORM	TEST LOCATION	WAVEFORM
IC301 PIN 9,10 REC/PB 2V/div. 5μs/div.		IC301 PIN 99 REC/PB 1V/div. 200ms/div.	
IC301 PIN 85 REC 2V/div. 10ms/div.		IC304 PIN 17, 22 REC/PB 200mV/div. 500μs/div.	
IC301 PIN 88 PB 500mV/div. 10ms/div.		IC304 UP: PIN 18 LOW: PIN23 REC/PB 2V/div. 200μs/div.	
IC301 PIN 93 REC/PB 2V/div. 100μs/div.			

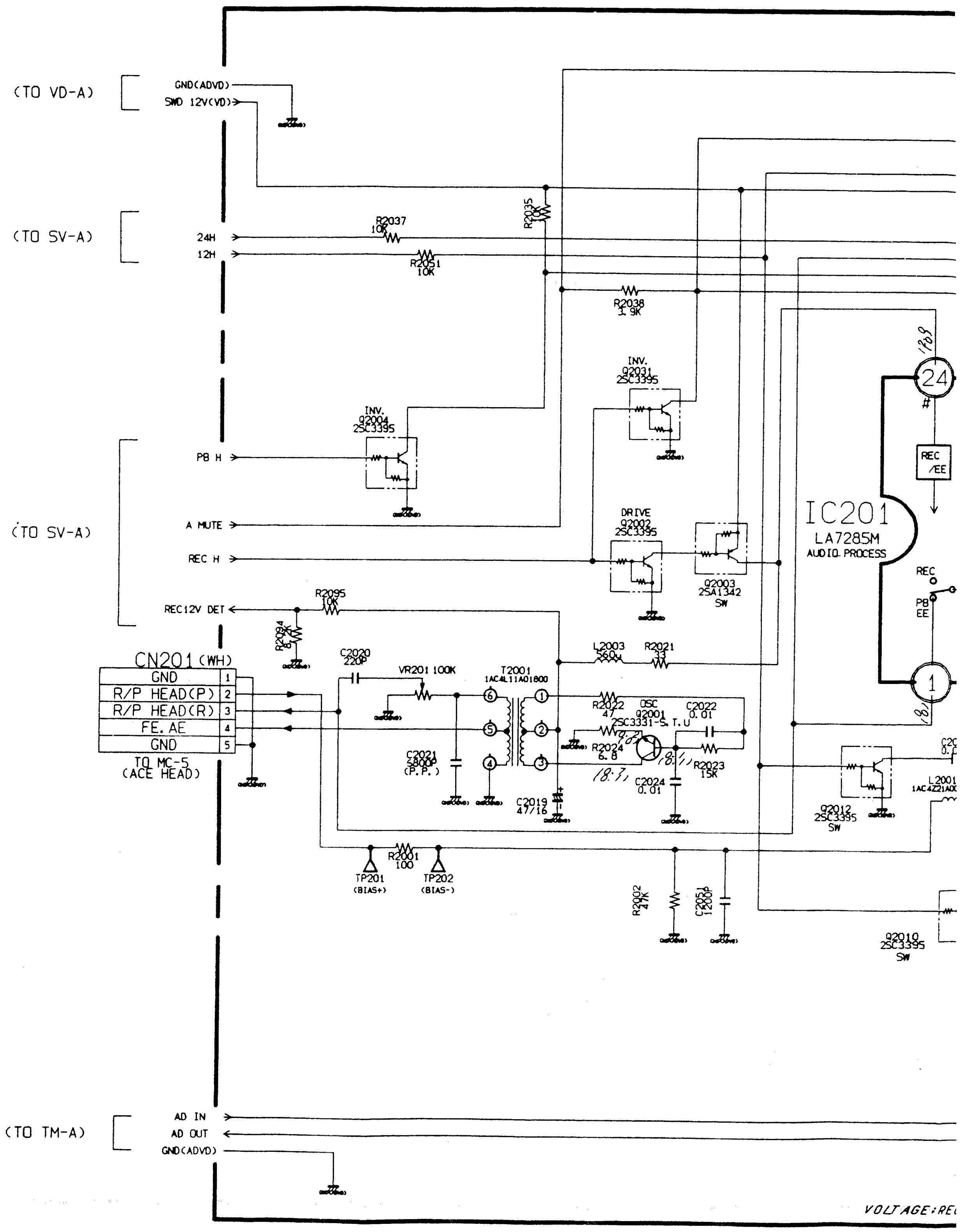
WF-S-FE4Q

IC301 SYSTEM/TIMER/TUNING CONTROL MPU PIN FUNCTION TABLE

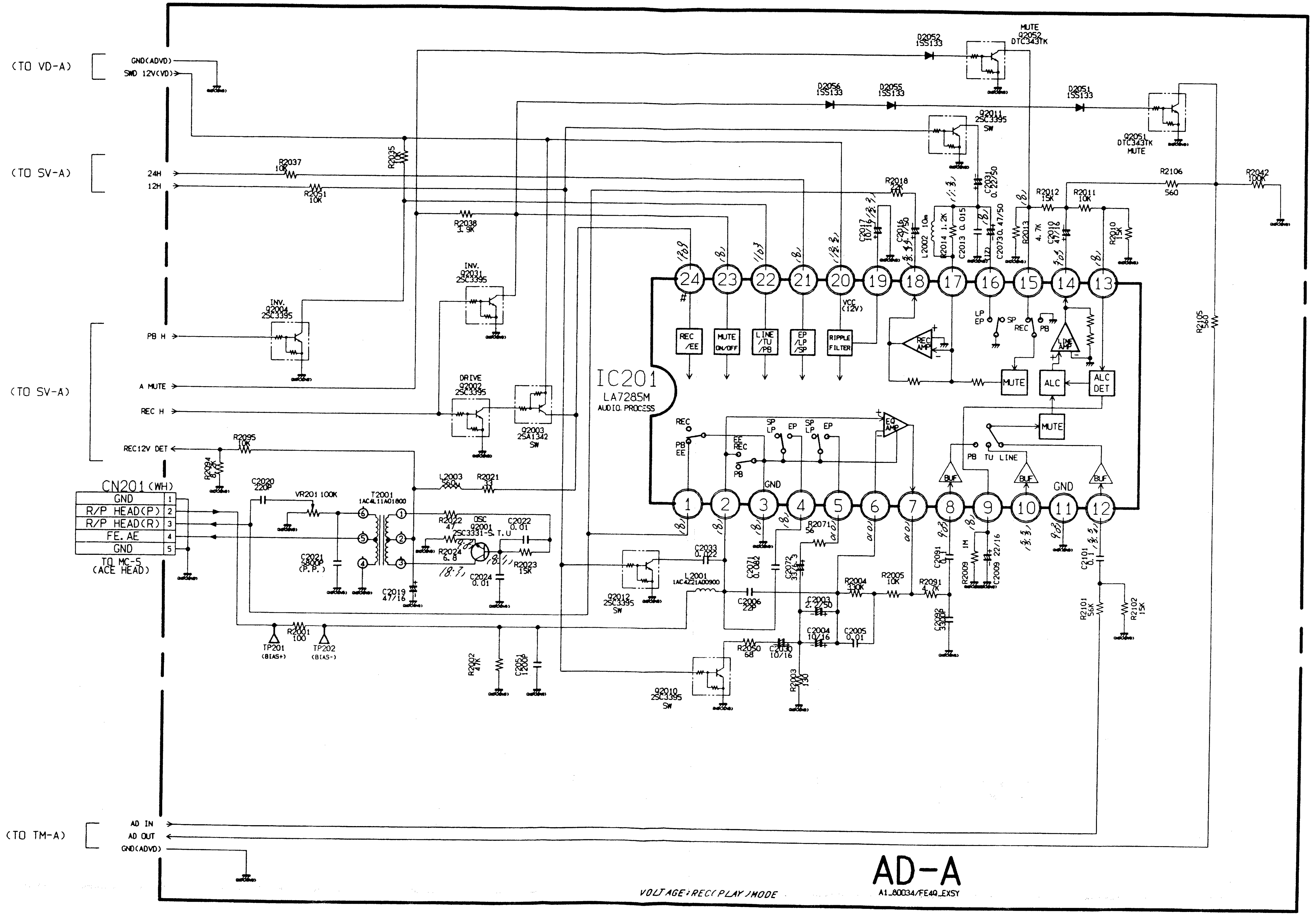
No.	Name	I/O	H/L	Signal Function
1	ORC0	O	-	Optimum picture control (ORC) data signal.
2	ORC1	O	-	Signal control to video recording current, EQ-amp characteristics, and PB picture frequency peaking.
3	ORC2	O	-	
4	TRS BUSY	O	H	Busy signal to 232C controal unit.
5	FLD C SELECT	O	H	Chip select signal to FLD display control MPU.
6	232C CLK	O	-	Clock signal to 232C controal unit.
7	232C DATA OUT	O	-	Output data to 232C controal unit.
8	232C DATA IN	I	-	Input data from 232C controal unit.
9	MH PWM	O	-	Output of head drum motor servo control signal. (pulse with modulation "PWM" signal)
10	MC PWM	O	-	Output of capstan motor servo control signal. (pulse with modulation "PWM" signal)
11	FLD CLK	O	-	Clock output to FLD display control MPU.
12	FLD DATA OUT	O	-	Data output to FLD display control MPU.
13	FLD DATA IN	I	-	Data input from FLD display control MPU.
14	Vdd	-	-	IC power source pin. (5v)
15	XT1	-	-	IC timer clock OSC terminal. Frequency is 32KHz.
16	XT2	-	-	
17	Vss	-	-	Ground terminal.
18	X2	-	-	IC clock OSC terminal. Frequency is 8MHz.
19	X1	-	-	
20	RESET	I	L	IC initial reset pin. (reset when "LOW")
21	TEST/VPP	-	-	NOT USE
22	AUTO EDJ OUT	-	-	NOT USE
23	VOICE CHANGE	O	H	Signal to indicate "Audio filter" is ON.
24	RF SW P	I	-	Input of RF switching pulse created by head drum PG.
25	ALARM OUT	O	-	Signal to indicate ALARM REC mode.
26	PB H	O	H	Signal for indicating playback mode.
27	REC H	O	H	Signal for indicating recording mode.
28	SPECIAL H	O	H	Special playback mode (search, slow, still, etc..) indication signal.
29	ROTARY	O	-	Video head CH1/CH2 confirmation signal. (Used in the processing of image circuit color signals.)
30	H. AMP SW	O	-	Main head and sub head switching signal.
31	QVD	O	H	Quasi vertical synchronizing signal.
32	OSD CLK	O	-	Clock to control on screen display control IC.
33	EXT ADJ OUT	O	H	Timer clock adjust signal output.
34	OSD CS	O	H	Cs signal output to on screen display control IC.
35	ORC MUTE	O	H	MUTE while ORC detector is working.
36	CAP START PULSE	O	-	Capstan motor intermittent drive control pulse.
37	MC F/R	O	-	Capstan motor rotation direction (normal/reverse) indication signal. (reverse; "H")
38	ML - D	O	-	Loading motor rotation direction indication signal. (load "H", brake "M", unload "L")
39	ML - S	O	-	Loading motor rotation speed (high / medium / low) indication signal.
40	Vss	-	-	Ground terminal.
41	Vdd	-	-	IC power source pin. (5v)
42	COMMON DATA	O	-	Data signal for OSD, DMSS and EEPROM IC.
43	EEPROM CLK	O	-	Clock to EEPROM IC.
44	DMSS CLK	O	-	Clock to DMSS IC.
45	AD MUTE	O	H	Signal disable audio signal output.
46	WARNING OUT	O	L	Warning signal output pin.
47	TIMER REC OUT	O	L	Timer recording mode indication signal.
48	BUZZER	O	-	Buzzer drive signal.
49	POWER UP	O	H	Power source ON/OFF signal. ("H" when on)
50	2H DELAY SW	O	H	2H delay circuit control signal.
51	SW OUT	O	H	Output of signal to "SW OUT" external output pin.
52	REC GATE	O	L	Signal that indicates video head recording timing in the REC mode. Especially in the 24H mode.
53	H COMP	O	-	Pulse that corrects the number of drum rotations during 24H recording.
54	8H	O	H	Output "H" during recording or playback in the 8H mode.
55	24H	O	H	Output "H" during recording or playback in the 24H mode.
56	40H	O	H	Output "H" during recording or playback in the 40H mode.
57	CTL 0/1 IN	I	-	Control duty indication signal input.
58	NC	-	-	-
59	CFG 1	I	-	Capstan motor FG-1 pulse input (for capstan servo).
60	CFG 2	I	-	Capstan motor FG-2 pulse input (for capstan "slow").
61	POWER DOWN	I	L	Power failure detection terminal.
62	ENV SW	I	-	Output comparison signal for main head and sub head.
63	ALARM RESET IN	I	H	Signal to stop ALARM REC.
64	EXT TIMER IN	I	H	Signal to start TIMER REC.
65	1 SHOT REC IN	I	H	Signal to start 1SHOT REC.
66	SERIES REC IN	O	H	Control signal for series REC mode input.
67	EXT ADJ IN	I	H	Timer clock adjust signal input.
68	REC 12V DET	I	L	REC mode indication signal input.
69	AVdd	-	-	IC power source pin for analog circuitry. (5v)
70	AVref	-	-	Reference voltage power source pin for analog circuitry.
71	ALARM IN	I	H	ALARM REC signal input.
72	SAFETY SW	I	L	Terminal for detecting accidental erasure prevention tab of cassette tape.
73	FL START SW	I	L	Terminal for detecting the start of cassette loading or discharge by cassette mechanism .
74	SW DATA 2	I	L	Input of the three-bit signal that indicates mechanism operational position.
75	SW DATA 1	I	L	
76	SW DATA 0	I	L	
77	REMOTE	I	-	Remote control signal input.
78	POWER DOWN	I	L	Reference voltage pin for AD port. (1/2Vcc)
79	VD ENV	I	-	Video head envelope detection signal input for ATR function.
80	T. END S.	I	L	Sensor signal input for tape end detection.
81	T. TOP S.	I	L	Sensor signal input for tape beginning detection.
82	DEW S	I	H	Dew sensor input pin.
83	AVss	-	-	Ground pin for analog circuitry.
84	CTL SLOPE	-	-	NOT USE
85	CTL HEAD +	I/O	-	CTL pulse I/O
86	CTL HEAD -	I/O	-	CTL pulse I/O
87	CTL IN	-	-	CTL AMP feed back filter
88	CTL SIG OUT	O	-	CTL AMP OUT
89	CTL AMP IN	I	-	Input signal from CTL AMP
90	Vref	-	-	Reference voltage power source pin for servo circuitry.
91	AVss1	-	-	Ground terminal.
92	AVdd1	-	-	IC power source pin for analog circuitry. (5V)
93	CFG IN	I	-	Capstan motor FG pulse input.
94	CFG SIG OUT	-	-	NOT USE
95	CFG AMP IN	-	-	NOT USE
96	DPG IN	I	-	Head drum PG pulse input. (Used in servo control and to generate the switching pulse.)
97	DFG IN	I	-	Head drum FG pulse input. (for head servo)
98	S REEL P	I	-	Supply reel moving sensor input.
99	T REEL P	I	-	Take up reel moving sensor input.
100	C SYNC	I	-	Composite synchronizing signal input.

FE4Q_IC301_A

CP-1 BOARD (

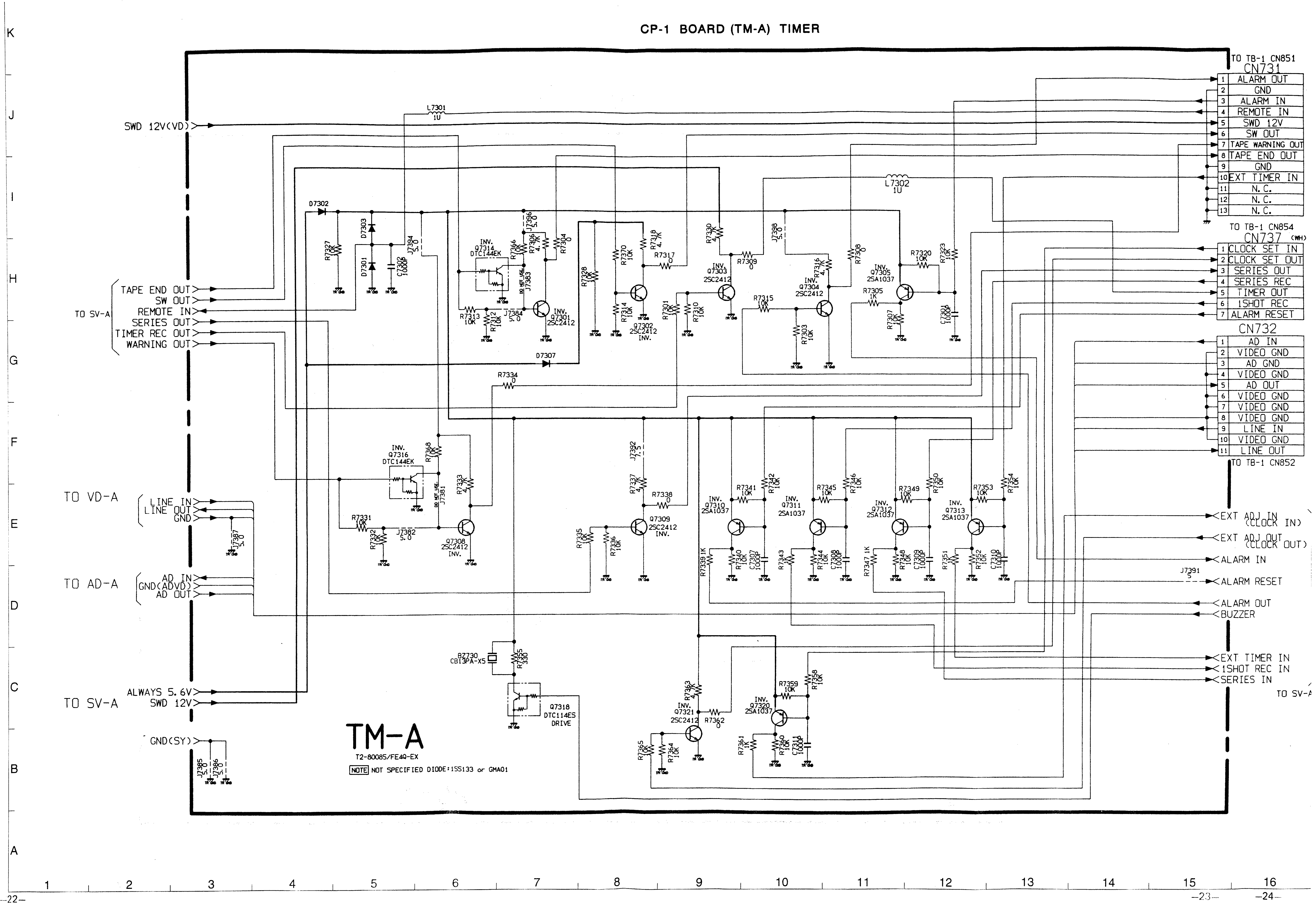


CP-1 BOARD (AD-A) AUDIO

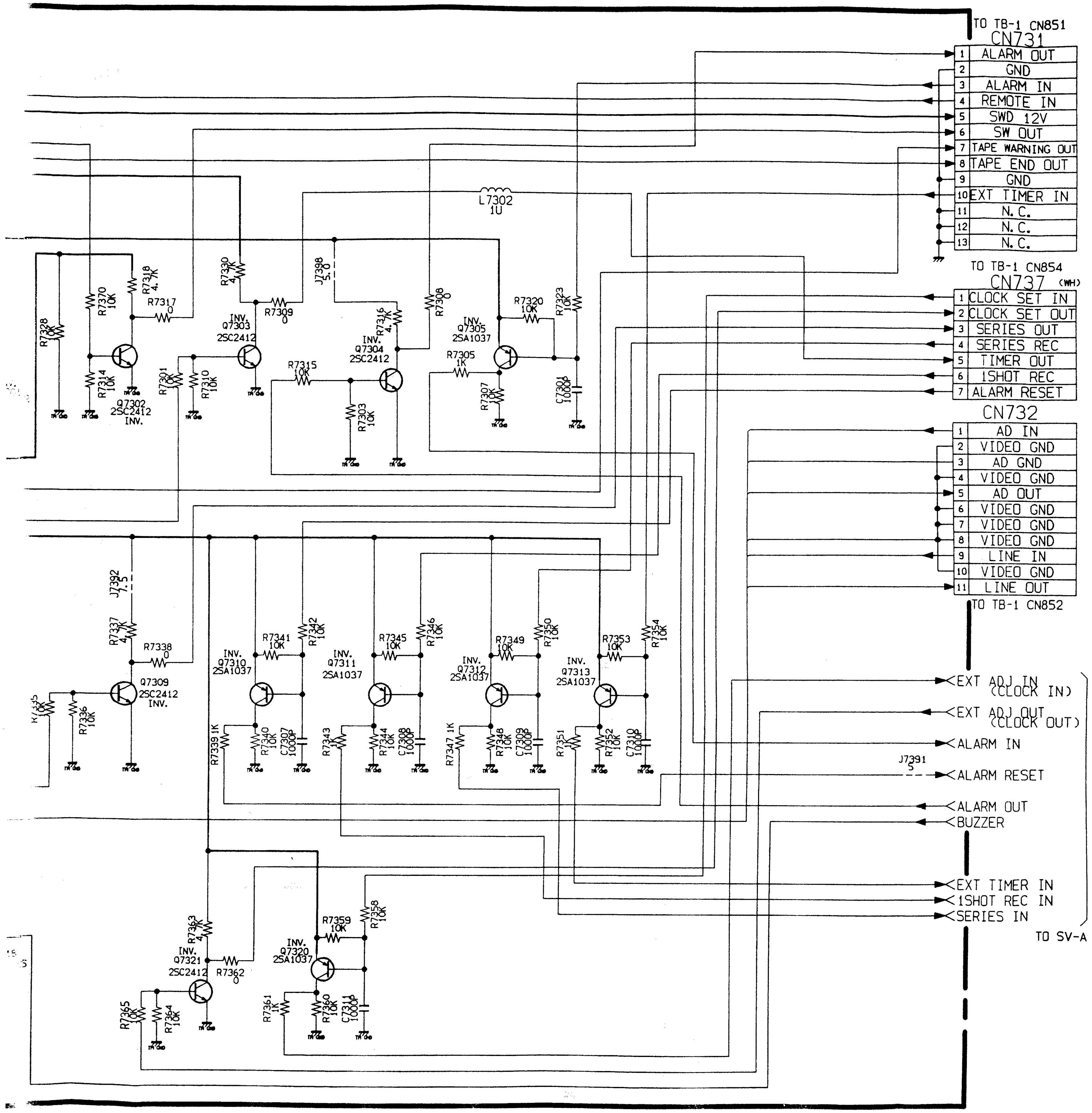


(TO VD-A)
GND(ADVD)
SWD 12V(VD)
(TO SV-A)
24H
12H
(TO SV-A)
PB H
A MUTE
REC H
REC12V DET
(TO TM-A)
AD IN
AD OUT
GND(ADVD)
CN201 (WH)
GND
R/P HEAD(P)
R/P HEAD(R)
FE. AE
GND
TO MC-5 (ACE HEAD)
IC201
LA7285M
AUDIO PROCESS
REC /EE
MUTE ON/OFF
LINE /TU /PB
EP /LP /SP
RIPPLE FILTER
VCC (12V)
REC AMP
LINE AMP
MUTE
ALC
ALC DET
EQ AMP
BUF
GND
PB TU LINE
Q2004 2SC3395 INV.
Q2031 2SC3395 INV.
Q2002 2SC3395 DRIVE
Q2003 2SA1342 SW
Q2001 2SC3331-S.T.U OSC
Q2011 2SC3395 SW
Q2052 DTC343TK MUTE
Q2051 DTC343TK MUTE
Q2012 2SC3395 SW
Q2010 2SC3395 SW
D2052 1SS133
D2056 1SS133
D2055 1SS133
D2051 1SS133
T2001 1AC4L11A01800
L2001 1AC4Z21A00900
L2002 10m
L2003 560μ
VR201 100K
TP201 (BIAS+)
TP202 (BIAS-)
R2037 10K
R2051 10K
R2035 10K
R2038 1.5K
R2095 10K
R2094 6.8K
R2021 33
R2022 47
R2024 6.8
R2023 15K
R2001 100
R2002 47K
R2071 56
R2004 330K
R2005 10K
R2091 4.7K
R2050 68
R2003 130
R2009 1M
R2018 22K
R2014 1.2K
R2013 4.7K
R2012 15K
R2011 10K
R2010 15K
R2106 560
R2042 100K
R2105 560
R2101 56K
R2102 15K
C2020 220P
C2021 6800P (P.P.)
C2019 47/16
C2022 0.01
C2024 0.01
C2033 0.022
C2071 0.082
C2072 33/6.3
C2006 22P
C2003 2.2/50
C2004 10/16
C2030 10/16
C2005 0.01
C2091
C2092 330P
C2009 22/16
C2101 0.1
C2017 10/16
C2016 4.7/50
C2013 0.015
C2031 0.22/50
C2073 0.47/50
C2010 47/16
AD-A
VOLTAGE: REC(PLAY)MODE
A1_80034/FE4Q_EXSY

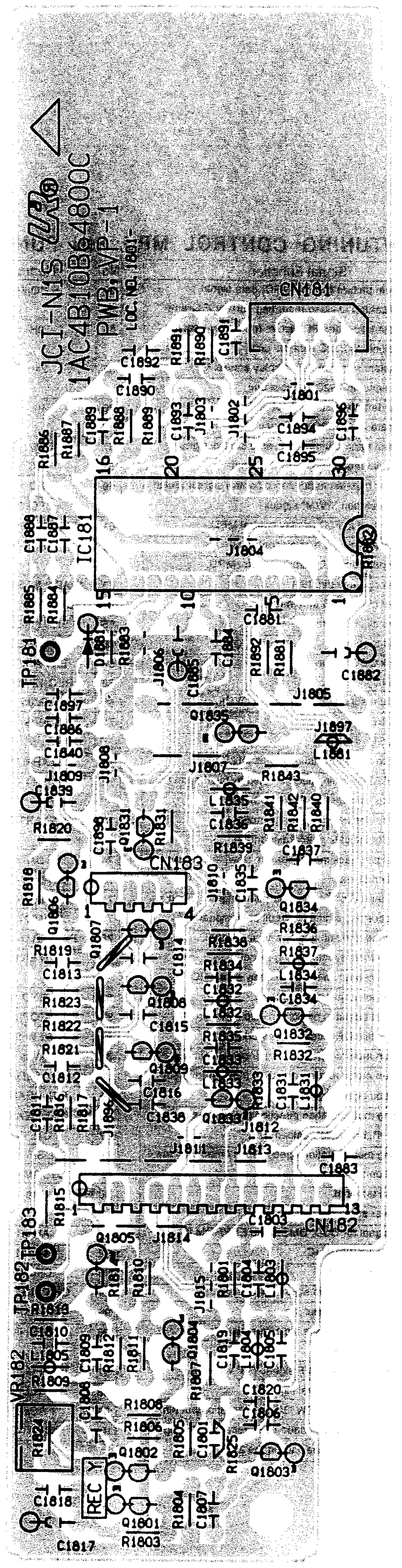
CP-1 BOARD (TM-A) TIMER


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
SWD 12V(VD)
TAPE END OUT
SW OUT
REMOTE IN
SERIES OUT
TIMER REC OUT
WARNING OUT
TO SV-A
TO VD-A
LINE IN
LINE OUT
GND
TO AD-A
AD IN
GND(ADVD)
AD OUT
ALWAYS 5.6V
SWD 12V
TO SV-A
GND(SY)
TO TB-1 CN851
CN731
1 ALARM OUT
2 GND
3 ALARM IN
4 REMOTE IN
5 SWD 12V
6 SW OUT
7 TAPE WARNING OUT
8 TAPE END OUT
9 GND
10 EXT TIMER IN
11 N.C.
12 N.C.
13 N.C.
TO TB-1 CN854
CN737 (WH)
1 CLOCK SET IN
2 CLOCK SET OUT
3 SERIES OUT
4 SERIES REC
5 TIMER OUT
6 1SHOT REC
7 ALARM RESET
CN732
1 AD IN
2 VIDEO GND
3 AD GND
4 VIDEO GND
5 AD OUT
6 VIDEO GND
7 VIDEO GND
8 VIDEO GND
9 LINE IN
10 VIDEO GND
11 LINE OUT
TO TB-1 CN852
EXT ADJ IN (CLOCK IN)
EXT ADJ OUT (CLOCK OUT)
ALARM IN
J7391 5
ALARM RESET
ALARM OUT
BUZZER
EXT TIMER IN
1SHOT REC IN
SERIES IN
TO SV-A
L7301 1U
L7302 1U
D7302
D7303
D7301
D7307
R7327 10K
C7302 1000P
J7394 5.0
INV. Q7314 DTC144EK
R7366 10K
J7396 5.0
R7306 4.7K
R7304 0
J7383
DO NOT USE
R7313 10K
R7312 10K
J7384 5.0
INV. Q7301 2SC2412
R7328 10K
R7370 10K
R7318 4.7K
R7317 0
R7314 10K
Q7302 2SC2412 INV.
R7330 4.7K
R7309 0
INV. Q7303 2SC2412
R7301 10K
R7310 10K
J7398 5.0
R7316 4.7K
INV. Q7304 2SC2412
R7315 10K
R7303 10K
R7308 10K
INV. Q7305 2SA1037
R7305 1K
R7307 10K
R7320 10K
R7323 10K
C7301 1000P
R7334 0
INV. Q7316 DTC144EK
R7368 10K
J7381
DO NOT USE
R7333 4.7K
R7331 10K
R7332 10K
J7382 5.0
Q7308 2SC2412 INV.
J7392 7.5
R7337 4.7K
R7338 0
Q7309 2SC2412 INV.
R7335 10K
R7336 10K
J7387 5.0
R7341 10K
R7342 10K
INV. Q7310 2SA1037
R7339 1K
R7340 10K
C7307 1000P
R7345 10K
R7346 10K
INV. Q7311 2SA1037
R7343 1K
R7344 10K
C7308 1000P
R7349 10K
R7350 10K
INV. Q7312 2SA1037
R7347 1K
R7348 10K
C7309 1000P
R7353 10K
R7354 10K
INV. Q7313 2SA1037
R7351 1K
R7352 10K
C7310 1000P
BZ730 CB13PA-X5
R7355 330
Q7318 DTC114ES DRIVE
R7363 4.7K
INV. Q7321 2SC2412
R7362 0
R7365 10K
R7364 10K
R7359 10K
R7358 10K
INV. Q7320 2SA1037
R7361 1K
R7360 10K
C7311 1000P
J7385 5.0
J7386 5.0
TM-A
T2-80085/FE4Q-EX
NOTE NOT SPECIFIED DIODE: 1SS133 or GMA01

CP-1 BOARD (TM-A) TIMER


TO TB-1 CN851
CN731
1 ALARM OUT
2 GND
3 ALARM IN
4 REMOTE IN
5 SWD 12V
6 SW OUT
7 TAPE WARNING OUT
8 TAPE END OUT
9 GND
10 EXT TIMER IN
11 N.C.
12 N.C.
13 N.C.
TO TB-1 CN854
CN737 (WH)
1 CLOCK SET IN
2 CLOCK SET OUT
3 SERIES OUT
4 SERIES REC
5 TIMER OUT
6 1SHOT REC
7 ALARM RESET
CN732
1 AD IN
2 VIDEO GND
3 AD GND
4 VIDEO GND
5 AD OUT
6 VIDEO GND
7 VIDEO GND
8 VIDEO GND
9 LINE IN
10 VIDEO GND
11 LINE OUT
TO TB-1 CN852
L7302 1U
J7398 5.0
R7328
R7370 10K
R7318 4.7K
R7317 0
R7314 10K
Q7302 2SC2412 INV.
R7301 10K
R7310 10K
R7330 4.7K
R7309 0
INV. Q7303 2SC2412
R7315 10K
R7303 10K
R7316 4.7K
INV. Q7304 2SC2412
R7308 0
INV. Q7305 2SA1037
R7305 1K
R7307 10K
R7320 10K
R7323 10K
C7306 1000P
J7392 7.5
R7337 4.7K
R7338 0
Q7309 2SC2412 INV.
R7336 10K
R7341 10K
R7342 10K
INV. Q7310 2SA1037
R7339 1K
R7340 10K
C7307 1000P
R7345 10K
R7346 10K
INV. Q7311 2SA1037
R7343
R7344 10K
C7308 1000P
R7349 10K
R7350 10K
INV. Q7312 2SA1037
R7347 1K
R7348 10K
C7309 1000P
R7353 10K
R7354 10K
INV. Q7313 2SA1037
R7351
R7352 10K
C7310 1000P
EXT ADJ IN (CLOCK IN)
EXT ADJ OUT (CLOCK OUT)
ALARM IN
J7391 5
ALARM RESET
ALARM OUT
BUZZER
EXT TIMER IN
1SHOT REC IN
SERIES IN
TO SV-A
R7363 4.7K
INV. Q7321 2SC2412
R7362 0
R7365 10K
R7364 10K
R7359 10K
R7358 10K
INV. Q7320 2SA1037
R7361 1K
R7360 10K
C7311 1000P
TR GND

VP-1 P.W.B.


JCI-N15 1AC4B10B64800C PWB,VP-1
CN181
IC181
CN183
CN182
TP181
TP182
TP183
VR182
REC Y
J1801
J1804
J1805
J1807
J1809
J1811
J1812
J1813
J1814
Q1801
Q1802
Q1803
Q1805
Q1832
Q1834
Q1835
C1881
C1882
C1883
C1890
C1892
C1894
C1895
C1817
C1818
R1803
R1806
R1820
R1832
R1837
R1839
R1843
L1861

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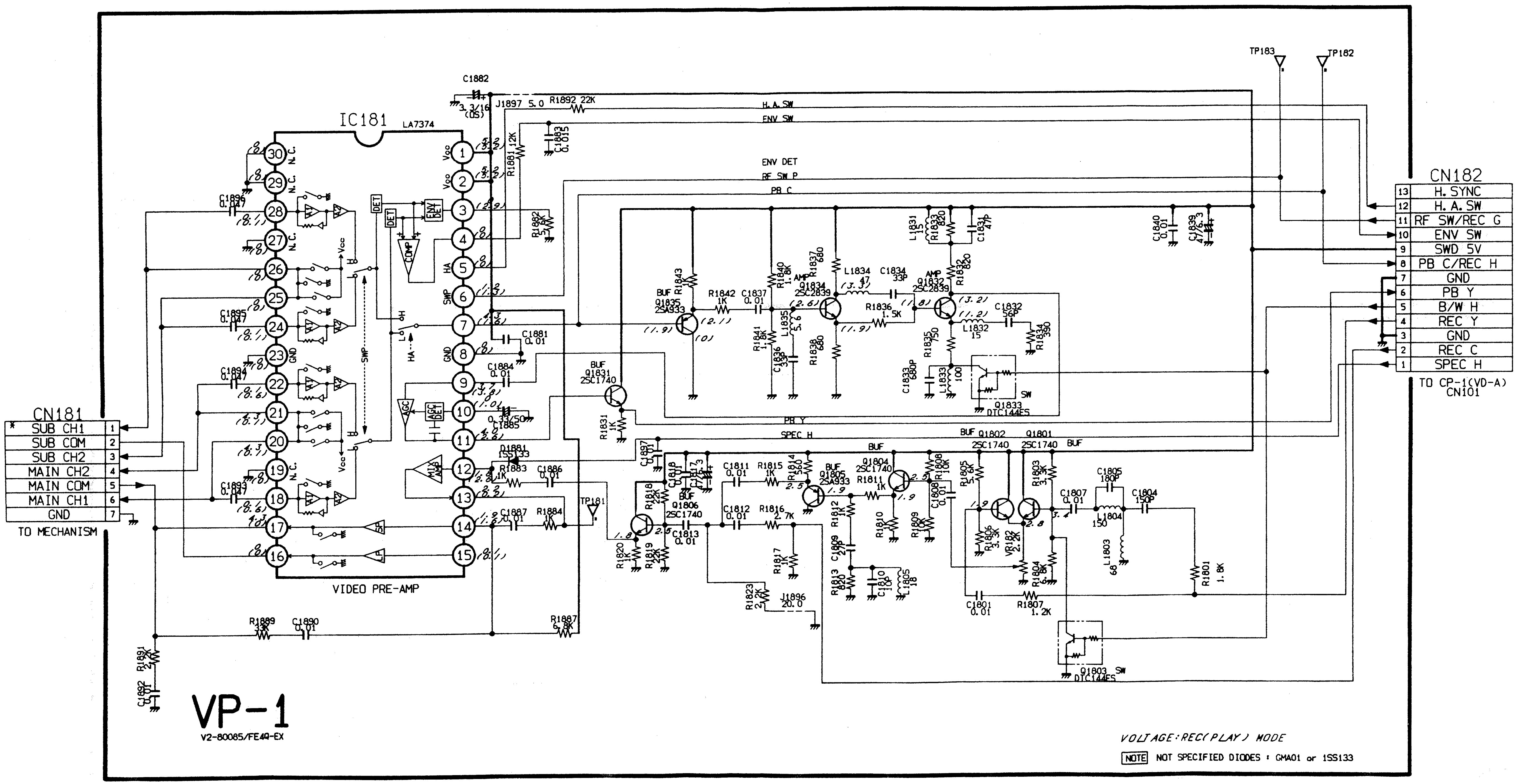
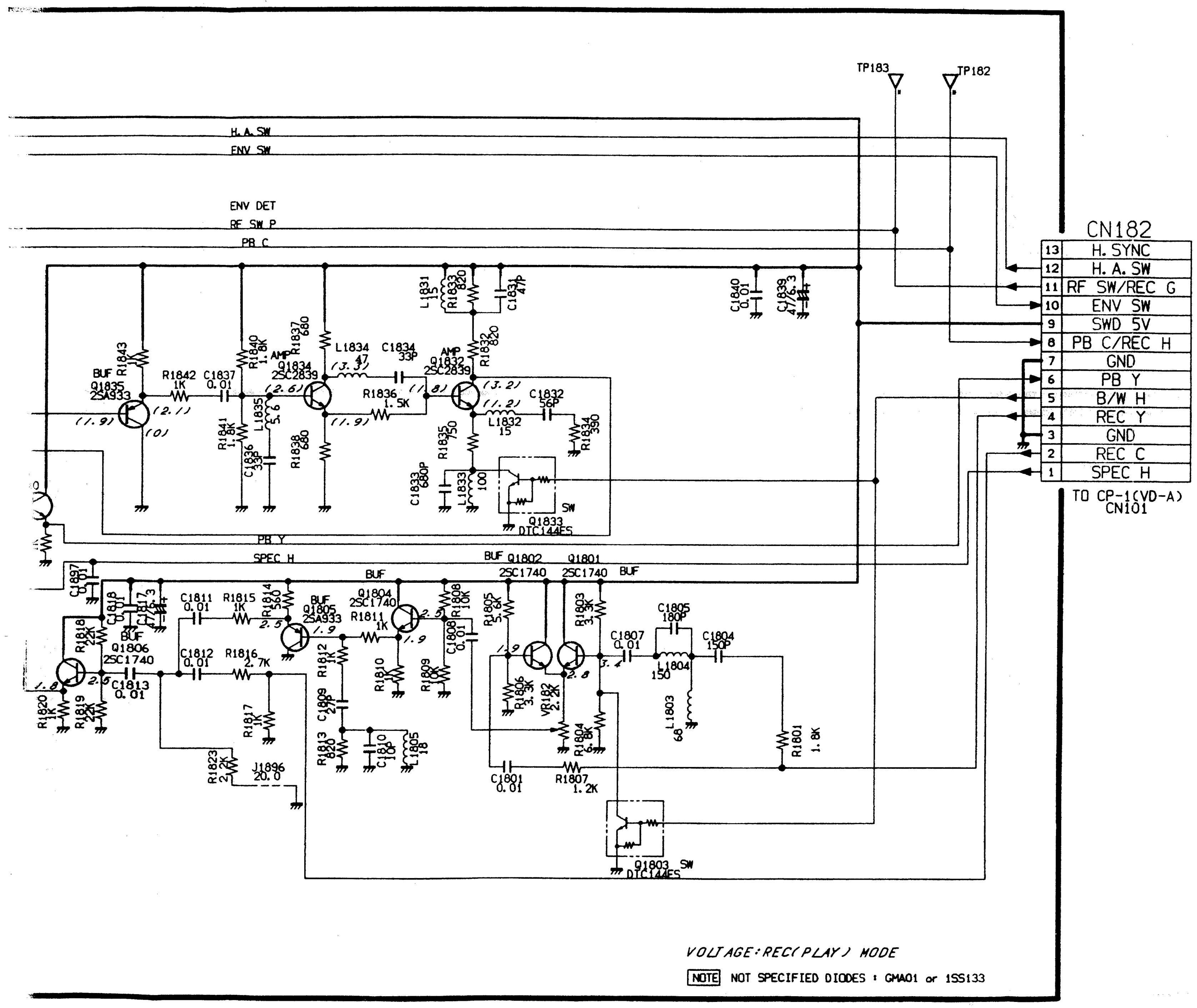
24

VP-1 BOARD VIDEO PRE-AMP


IC181 LA7374
VIDEO PRE-AMP
CN181
SUB CH1
SUB COM
SUB CH2
MAIN CH2
MAIN COM
MAIN CH1
GND
TO MECHANISM
CN182
H. SYNC
H. A. SW
RF SW/REC G
ENV SW
SWD 5V
PB C/REC H
GND
PB Y
B/W H
REC Y
GND
REC C
SPEC H
TO CP-1(VD-A) CN101
TP183
TP182
TP181
H. A. SW
ENV SW
ENV DET
RF SW P
PB C
PB Y
SPEC H
Q1831 2SC1740 BUF
Q1835 2SA933 BUF
Q1834 2SC2839 AMP
Q1832 2SC2839 AMP
Q1833 DTC144ES SW
Q1802 2SC1740 BUF
Q1801 2SC1740 BUF
Q1804 2SC1740 BUF
Q1805 2SA933 BUF
Q1806 2SC1740 BUF
Q1803 DTC144ES SW
D1881 1SS133
VR182 2.2K
VP-1
V2-80085/FE4Q-EX
VOLTAGE: REC(PLAY) MODE
NOTE NOT SPECIFIED DIODES : GMA01 or 1SS133

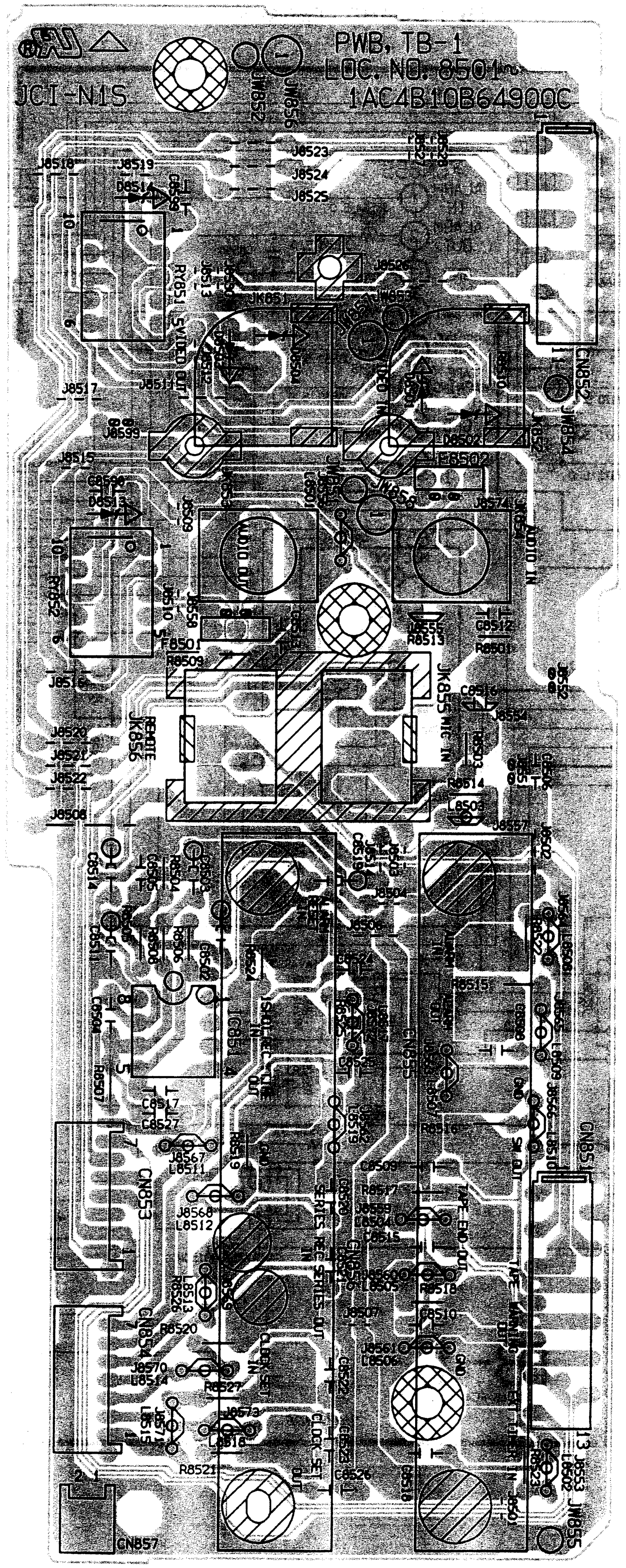
VP-1 BOARD VIDEO PRE-AMP


TP183
TP182
H. A. SW
ENV SW
ENV DET
RF SW P
PB C
CN182
13 H. SYNC
12 H. A. SW
11 RF SW/REC G
10 ENV SW
9 SWD 5V
8 PB C/REC H
7 GND
6 PB Y
5 B/W H
4 REC Y
3 GND
2 REC C
1 SPEC H
TO CP-1(VD-A) CN101
BUF Q1835 2SA933
R1843
R1842 1K
C1837 0.01
R1840 1.8K
R1841 1.8K
L1835 5.6
C1836 33P
AMP Q1834 2SC2839
R1837 680
R1838 680
L1834 47
C1834 33P
R1836 1.5K
AMP Q1832 2SC2839
R1832 820
L1831 15
R1833 820
C1831 47P
C1832 56P
L1832 15
R1834 390
R1835 750
C1833 680P
L1833 100
Q1833 DTC144ES
SW
C1840 0.01
C1839 47/6.3
PB Y
SPEC H
C1897 0.01
C1818 0.01
C1817 47/6.3
BUF Q1806 2SC1740
R1818 22K
R1820 1K
R1819 22K
C1813 0.01
C1811 0.01
R1815 1K
R1814 560
C1812 0.01
R1816 2.7K
R1817 1K
R1823 2.2K
J1896 20.0
BUF Q1805 2SA933
R1811 1K
R1812 1K
R1810 1K
R1809
C1809 27P
R1813 820
C1810 18P
L1805 18
BUF Q1804 2SC1740
R1808 10K
C1808 0.01
BUF Q1802 2SC1740
Q1801 2SC1740 BUF
R1805 5.6K
R1806 3.3K
VR182 2.2K
R1803 3.3K
R1804 6.8K
C1807 0.01
C1805 180P
L1804 150
C1804 150P
L1803 68
R1801 1.8K
C1801 0.01
R1807 1.2K
Q1803 DTC144ES SW

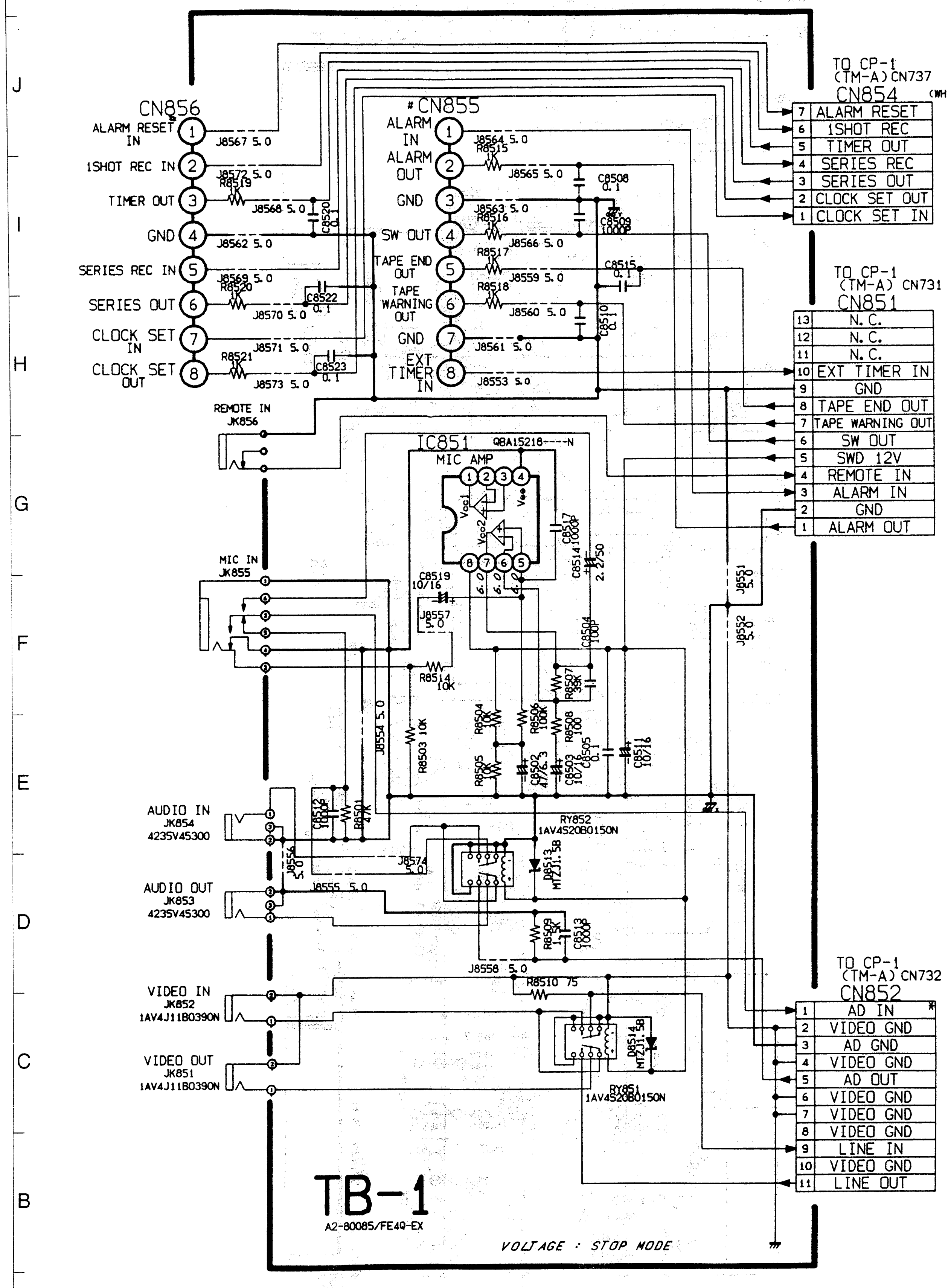
VOLTAGE: REC(PLAY) MODE

NOTE NOT SPECIFIED DIODES : GMA01 or 1SS133

TB-1 P.W.B.

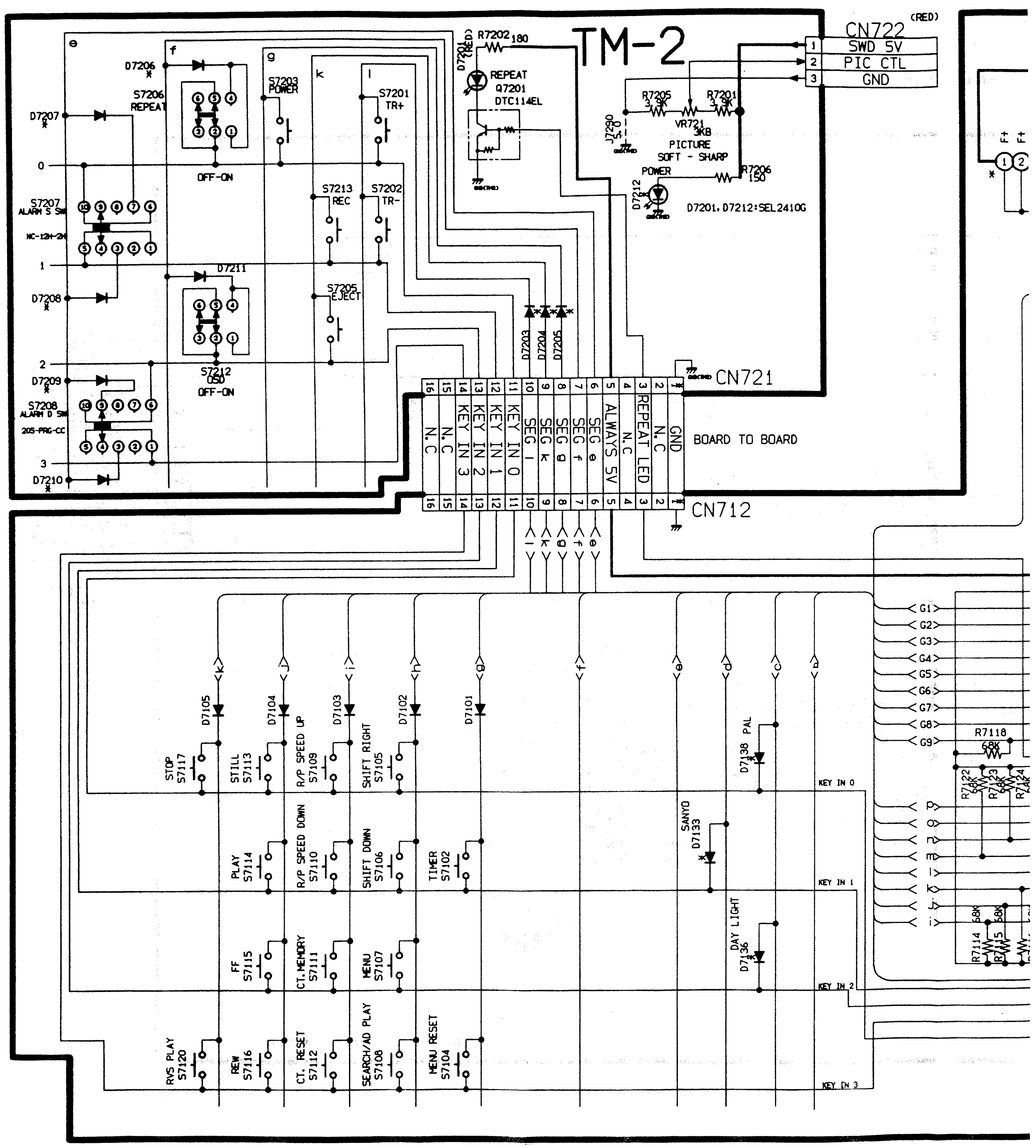

PWB, TB-1
LOC. NO. 8501
1AC4B10B64900C
JCI-N1S
CN852
CN851
CN853
CN854
CN857
JK856
REMOTE
AUDIO OUT
AUDIO IN
VIDEO OUT
VIDEO IN
RY851
RY852
JW855
L8502

TB-1 BOARD TERMINAL



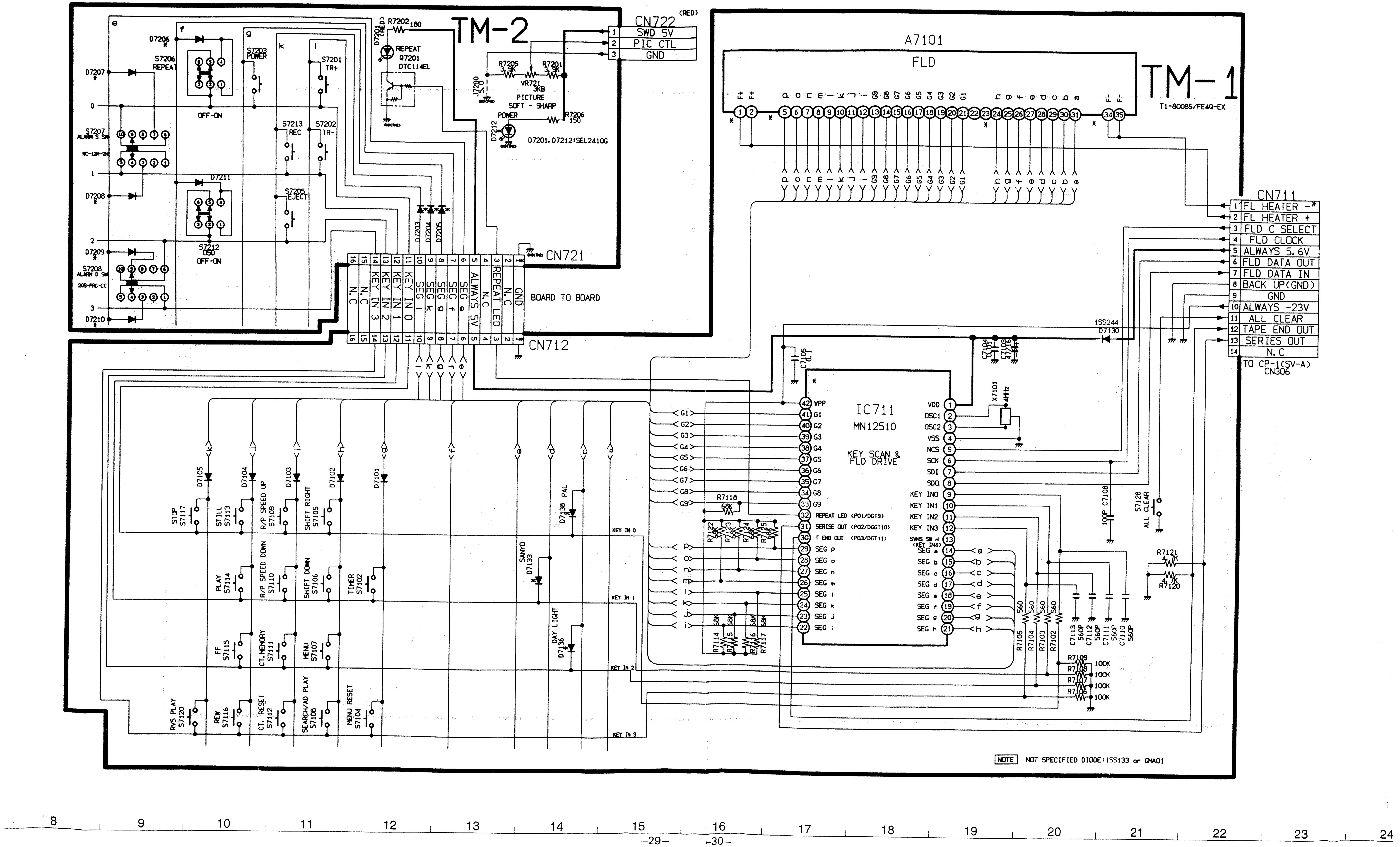
CN856
ALARM RESET IN
1SHOT REC IN
TIMER OUT
GND
SERIES REC IN
SERIES OUT
CLOCK SET IN
CLOCK SET OUT
CN855
ALARM IN
ALARM OUT
GND
SW OUT
TAPE END OUT
TAPE WARNING OUT
GND
EXT TIMER IN
TO CP-1 (TM-A) CN737
CN854 (WH)
7 ALARM RESET
6 1SHOT REC
5 TIMER OUT
4 SERIES REC
3 SERIES OUT
2 CLOCK SET OUT
1 CLOCK SET IN
TO CP-1 (TM-A) CN731
CN851
13 N.C.
12 N.C.
11 N.C.
10 EXT TIMER IN
9 GND
8 TAPE END OUT
7 TAPE WARNING OUT
6 SW OUT
5 SWD 12V
4 REMOTE IN
3 ALARM IN
2 GND
1 ALARM OUT
REMOTE IN JK856
IC851 QBA15216----N
MIC AMP
MIC IN JK855
AUDIO IN JK854 4235V45300
AUDIO OUT JK853 4235V45300
VIDEO IN JK852 1AV4J11B0390N
VIDEO OUT JK851 1AV4J11B0390N
RY852 1AV4S20B0150N
RY851 1AV4S20B0150N
TO CP-1 (TM-A) CN732
CN852
1 AD IN
2 VIDEO GND
3 AD GND
4 VIDEO GND
5 AD OUT
6 VIDEO GND
7 VIDEO GND
8 VIDEO GND
9 LINE IN
10 VIDEO GND
11 LINE OUT
TB-1
A2-80085/FE40-EX
VOLTAGE : STOP MODE

TM-1, 2 BOARDS TIMER, DISPLAY (FLD) &



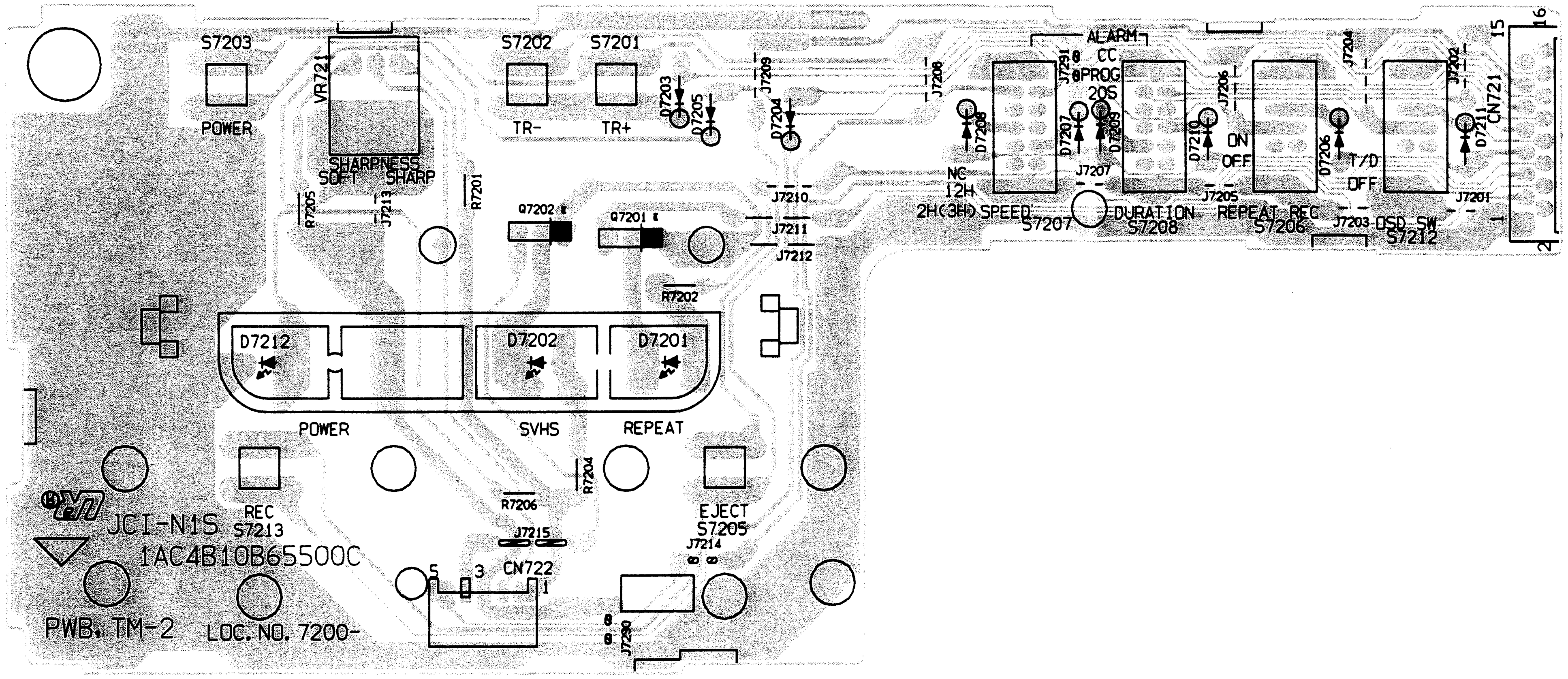
TM-2
CN722 (RED)
1 SWD 5V
2 PIC CTL
3 GND
REPEAT Q7201 DTC114EL
VR721 3KB PICTURE SOFT - SHARP
POWER
D7201, D7212:SEL2410G
S7206 REPEAT
S7203 POWER
S7201 TR+
S7202 TR-
S7213 REC
S7205 EJECT
S7207 ALARM S SW
S7212 OSD OFF-ON
S7208 ALARM D SW
OFF-ON
CN721
BOARD TO BOARD
CN712
16 N.C
15 N.C
14 KEY IN 3
13 KEY IN 2
12 KEY IN 1
11 KEY IN 0
10 SEG l
9 SEG k
8 SEG g
7 SEG f
6 SEG e
5 ALWAYS 5V
4 N.C
3 REPEAT LED
2 N.C
1 GND
STOP S7117
STILL S7113
R/P SPEED UP S7109
SHIFT RIGHT S7105
PLAY S7114
R/P SPEED DOWN S7110
SHIFT DOWN S7106
TIMER S7102
FF S7115
CT.MEMORY S7111
MENU S7107
RVS PLAY S7120
REW S7116
CT. RESET S7112
SEARCH/AD PLAY S7108
MENU RESET S7104
SANYO D7133
PAL D7138
DAY LIGHT D7136
KEY IN 0
KEY IN 1
KEY IN 2
KEY IN 3
G1 G2 G3 G4 G5 G6 G7 G8 G9
R7118 68K

TM-1, 2 BOARDS TIMER, DISPLAY (FLD) & SWITCH

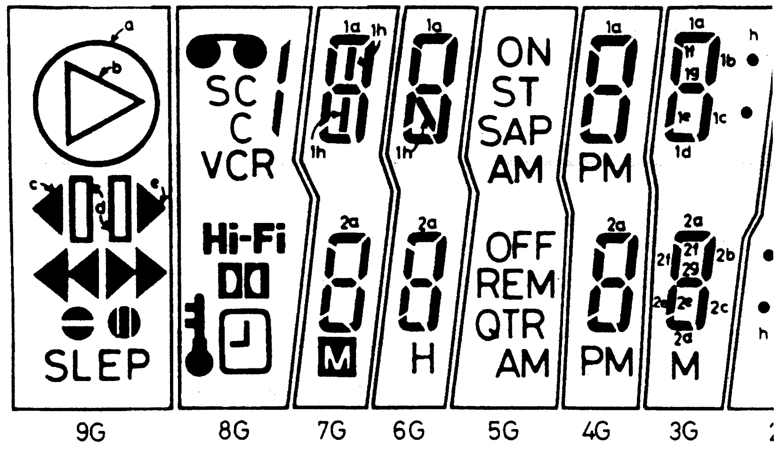

TM-2
TM-1
CN722 (RED)
1 SWD 5V
2 PIC CTL
3 GND
R7202 180
D7201 (RED)
REPEAT
Q7201
DTC114EL
R7205 3.9K
R7201 3.9K
VR721 3KB
PICTURE
SOFT - SHARP
J7290 5.0
POWER
D7212
R7206 150
D7201, D7212:SEL2410G
D7206
S7206 REPEAT
D7207
S7207 ALARM S SW
NC-12H-2H
D7208
D7211
S7212 OSD
OFF-ON
S7203 POWER
S7201 TR+
S7213 REC
S7202 TR-
S7205 EJECT
D7209
S7208 ALARM D SW
205-PRG-CC
D7210
D7203
D7204
D7205
CN721
BOARD TO BOARD
CN712
16 N.C
15 N.C
14 KEY IN 3
13 KEY IN 2
12 KEY IN 1
11 KEY IN 0
10 SEG i
9 SEG k
8 SEG g
7 SEG f
6 SEG e
5 ALWAYS 5V
4 N.C
3 REPEAT LED
2 N.C
1 GND
A7101
FLD
T1-80085/FE4Q-EX
F+ F+ p o n m l k j i G9 G8 G7 G6 G5 G4 G3 G2 G1 h g f e d c b a F- F-
CN711
1 FL HEATER -
2 FL HEATER +
3 FLD C SELECT
4 FLD CLOCK
5 ALWAYS 5.6V
6 FLD DATA OUT
7 FLD DATA IN
8 BACK UP(GND)
9 GND
10 ALWAYS -23V
11 ALL CLEAR
12 TAPE END OUT
13 SERIES OUT
14 N.C
TO CP-1(SV-A) CN306
1SS244 D7130
C7105 0.1
C7104 0.01
C7103 47/16
X7101 4MHz
IC711
MN12510
KEY SCAN & FLD DRIVE
42 VPP
41 G1
40 G2
39 G3
38 G4
37 G5
36 G6
35 G7
34 G8
33 G9
32 REPEAT LED (P01/DGT9)
31 SERISE OUT (P02/DGT10)
30 T END OUT (P03/DGT11)
29 SEG p
28 SEG o
27 SEG n
26 SEG m
25 SEG l
24 SEG k
23 SEG j
22 SEG i
1 VDD
2 OSC1
3 OSC2
4 VSS
5 NCS
6 SCK
7 SDI
8 SDO
9 KEY IN0
10 KEY IN1
11 KEY IN2
12 KEY IN3
13 SVHS SW H (KEY IN4)
14 SEG a
15 SEG b
16 SEG c
17 SEG d
18 SEG e
19 SEG f
20 SEG g
21 SEG h
R7118 68K
R7122 R7123 R7124 R7125 68K
R7114 R7115 R7116 R7117 68K
C7108 100P
S7128 ALL CLEAR
R7121 4.7K
R7120 4.7K
R7105 R7104 R7103 R7102 560
C7113 C7112 C7111 C7110 560P
R7109 R7108 R7107 R7106 100K
D7105 D7104 D7103 D7102 D7101
STOP S7117
STILL S7113
R/P SPEED UP S7109
SHIFT RIGHT S7105
PLAY S7114
R/P SPEED DOWN S7110
SHIFT DOWN S7106
TIMER S7102
FF S7115
CT.MEMORY S7111
MENU S7107
RVS PLAY S7120
REW S7116
CT. RESET S7112
SEARCH/AD PLAY S7108
MENU RESET S7104
PAL D7138
SANYO D7133
DAY LIGHT D7136
KEY IN 0
KEY IN 1
KEY IN 2
KEY IN 3
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

NOTE NOT SPECIFIED DIODE: 1SS133 or GMA01

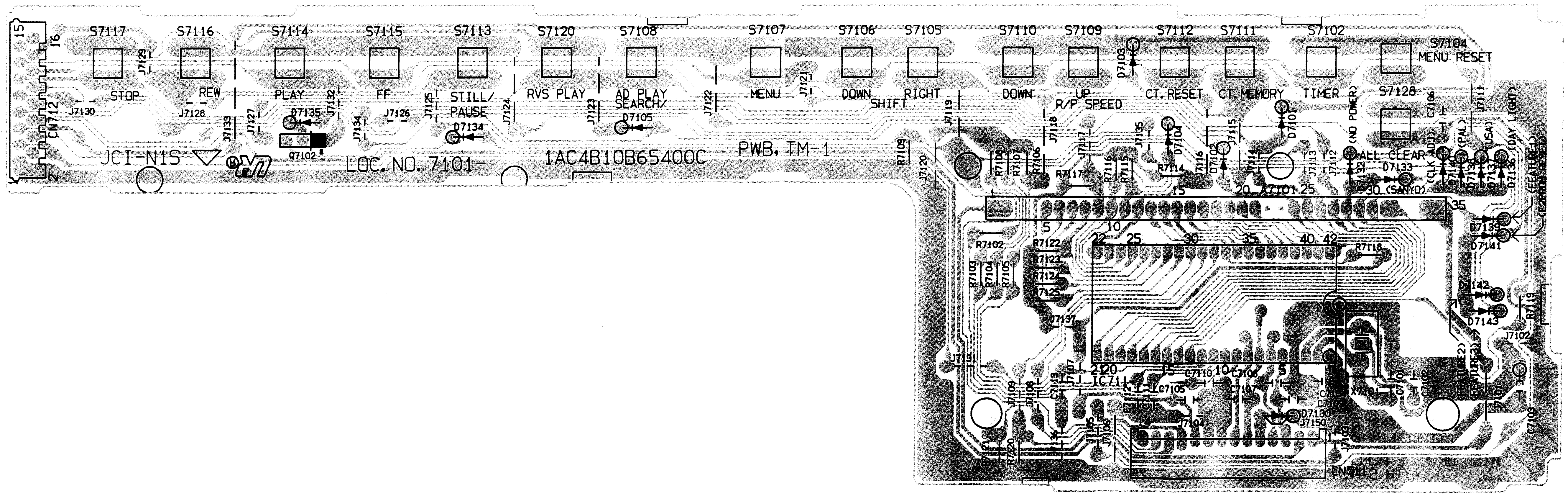
TM-2 P.W.B.

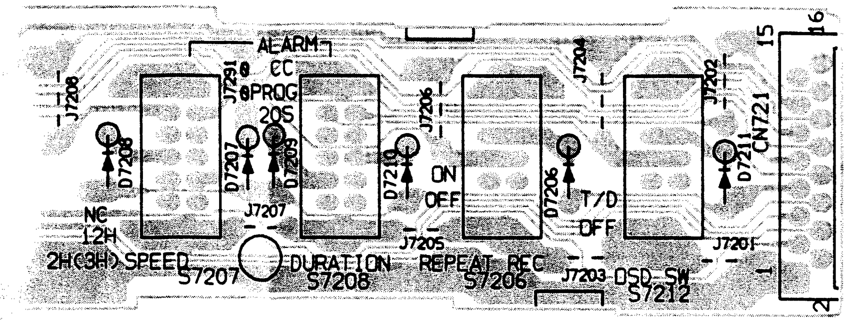

S7203
POWER
VR721
SHARPNESS
SOFT SHARP
S7202
TR-
S7201
TR+
D7203
D7205
D7204
J7209
J7208
ALARM
CC
PROG
20S
NC
12H
2H(3H) SPEED
S7207
DURATION
S7208
ON
OFF
REPEAT REC
S7206
T/D
OFF
OSD SW
S7212
CN721
Q7202
Q7201
R7202
D7212
D7202
D7201
POWER
SVHS
REPEAT
REC
S7213
EJECT
S7205
CN722
R7206
R7204
J7215
J7214
JCI-N1S
1AC4B10B65500C
PWB. TM-2
LOC. NO. 7200-

A7101 DISPLAY (FLD) GI

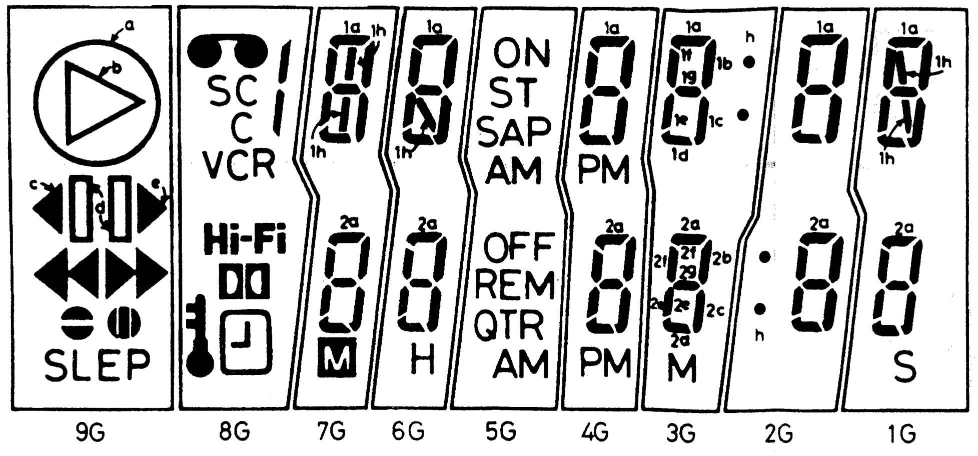

SC
C
VCR
Hi-Fi
SLEP
ON
ST
SAP
AM
PM
OFF
REM
QTR
AM
PM
H
M
9G
8G
7G
6G
5G
4G
3G

TM-1 P.W.B.


CN712
S7117
STOP
S7116
REW
S7114
PLAY
S7115
FF
S7113
STILL/
PAUSE
S7120
RVS PLAY
S7108
AD PLAY
SEARCH/
S7107
MENU
S7106
DOWN
SHIFT
S7105
RIGHT
S7110
DOWN
S7109
UP
R/P SPEED
S7112
CT. RESET
S7111
CT. MEMORY
S7102
TIMER
S7104
MENU RESET
S7128
ALL CLEAR
D7135
Q7102
D7134
D7105
D7103
D7104
D7101
A7101
IC711
X7101
CN711
JCI-N1S
LOC. NO. 7101-
1AC4B10B65400C
PWB. TM-1

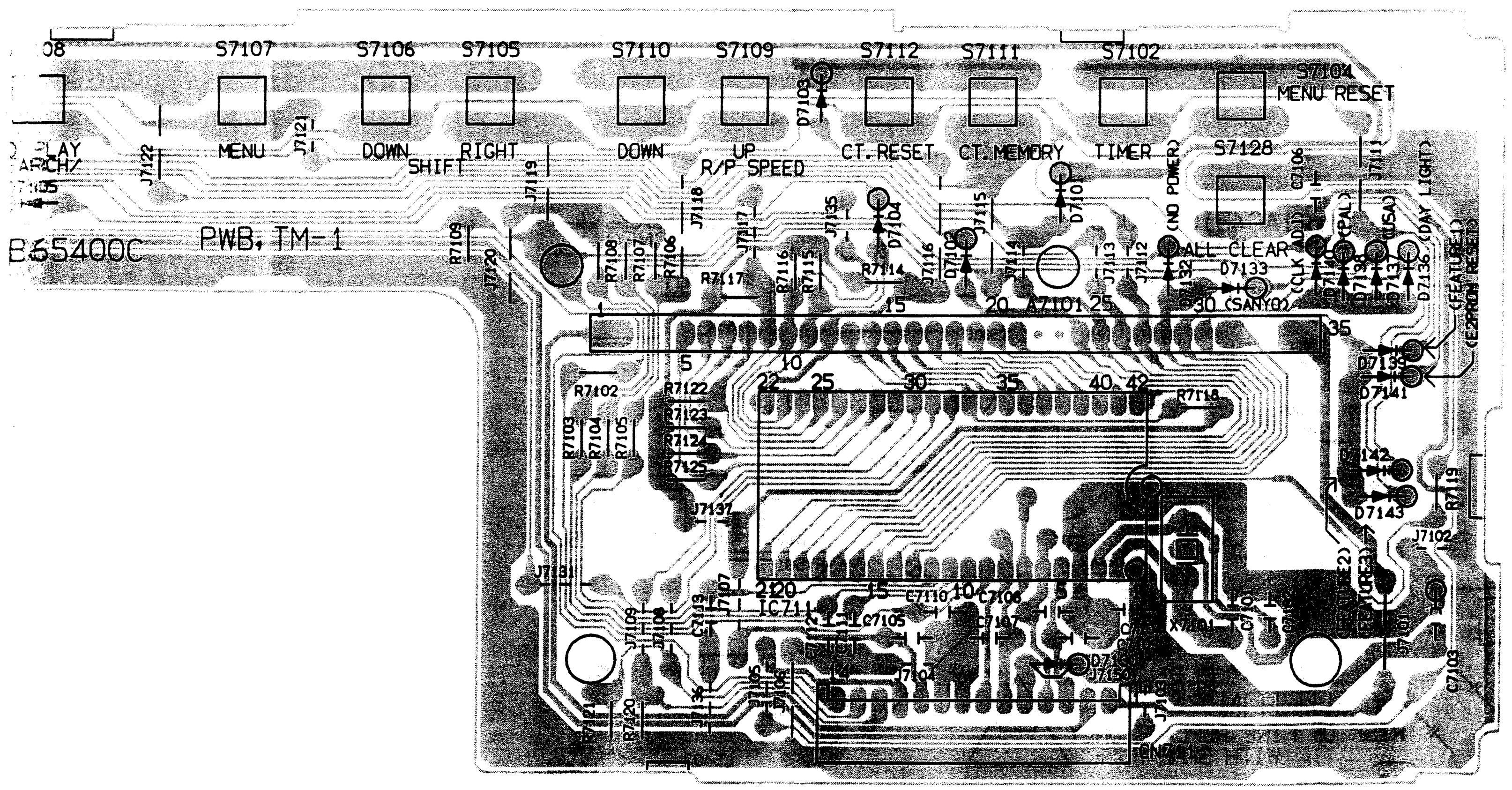

ALARM
CC
PROG
205
J7208
D7208
J7291
D7207
J7207
D7209
J7206
D7210
ON
OFF
J7205
J7204
D7206
T/D
OFF
J7202
D7211
CN721
J7201
J7203
NC
12H
2H(3H) SPEED
S7207
DURATION
S7208
REPEAT
S7206
REC
DSD-SW
S7212
15
16
1
2

A7101 DISPLAY (FLD) GRID/ANODE ASSIGNMENT DRAWING & TABLE

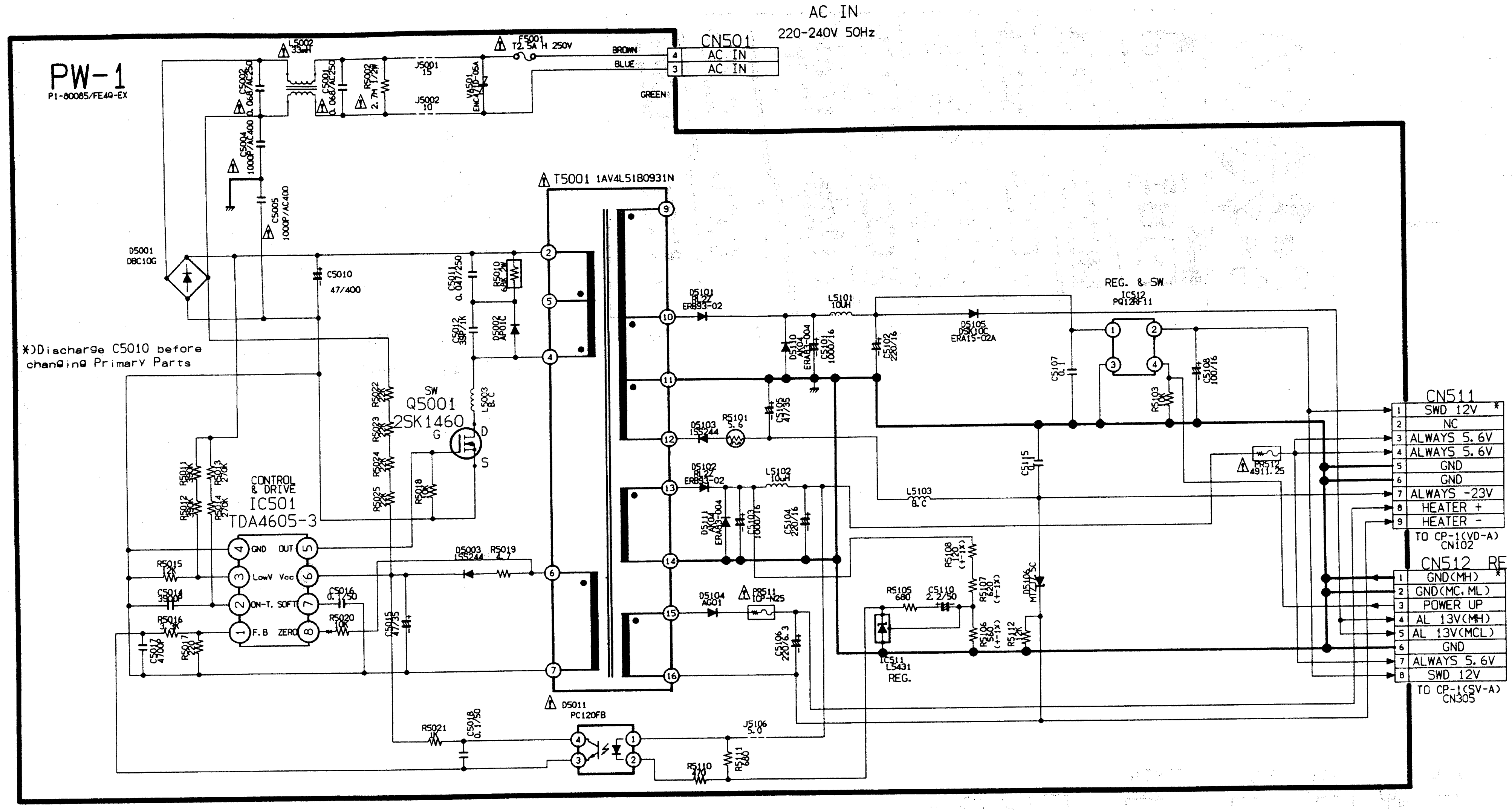

a
b
c
d
e
SC
C
VCR
Hi-Fi
SLEP
1a
1h
2a
M
H
ON
ST
SAP
AM
OFF
REM
QTR
AM
PM
PM
1b
1c
1d
1f
1g
1e
2f
2g
2e
2b
2c
2d
h
S
9G
8G
7G
6G
5G
4G
3G
2G
1G

Segment ↓ / Grid →	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	◯	●●	1a	1a	ON	1a	1a	1a	1a
b	▷	SC	1b	1b	ST	1b	1b	1b	1b
c	◀	/	1c	1c	SAP	1c	1c	1c	1c
d	▯▯	C	1d	1d	AM	1d	1d	1d	1d
e	▶	VCR	1e	1e		1e	1e	1e	1e
f			1f	1f		1f	1f	1f	1f
g			1g	1g		1g	1g	1g	1g
h			1h	1h		PM	:	:	1h
i	◀◀	DD	2a	2a	OFF	2a	2a	2a	2a
j	▶▶	**Hi-Fi**	2b	2b	REM	2b	2b	2b	2b
k	⊖	🌡	2c	2c	QTR	2c	2c	2c	2c
l	◍	🕒	2d	2d	AM	2d	2d	2d	2d
m	S		2e	2e		2e	2e	2e	2e
n	L		2f	2f		2f	2f	2f	2f
o	E		2g	2g		2g	2g	2g	2g
p	P		**M**	H		PM	M		S

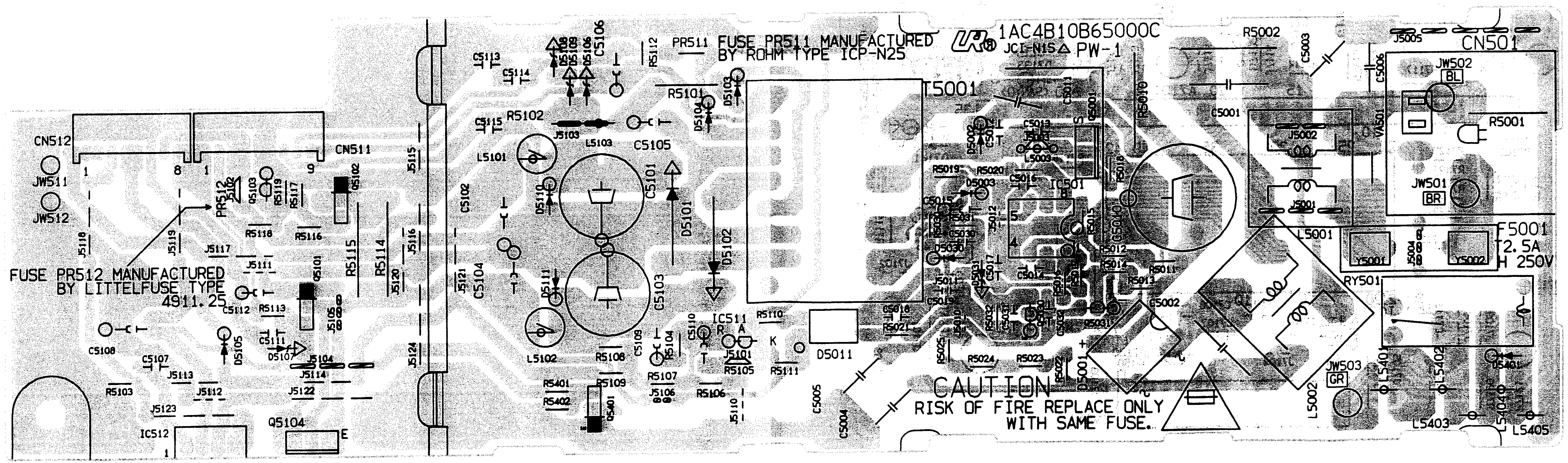
TM-1 P.W.B.


S7107
S7106
S7105
S7110
S7109
S7112
S7111
S7102
S7104
MENU RESET
PLAY
ARCH/
MENU
DOWN
SHIFT
RIGHT
DOWN
UP
R/P SPEED
CT. RESET
CT. MEMORY
TIMER
S7128
B65400C
PWB, TM-1
(NO POWER)
ALL CLEAR
D7133
(SANYO)
(CLK ADJ)
(PAL)
(USA)
(DAY LIGHT)
(FEATURE1)
(E2PROM RESET)
A7101
IC71
R7109
R7108
R7107
R7106
R7117
R7116
R7115
R7114
R7102
R7122
R7123
R7124
R7118
R7119
J7137
J7107
J7109
D7103
D7104
D7101
D7139
D7141
D7142
D7143
C7110
C7106
C7105
C7107
C7103
5
10
15
20
22
25
30
35
40
42

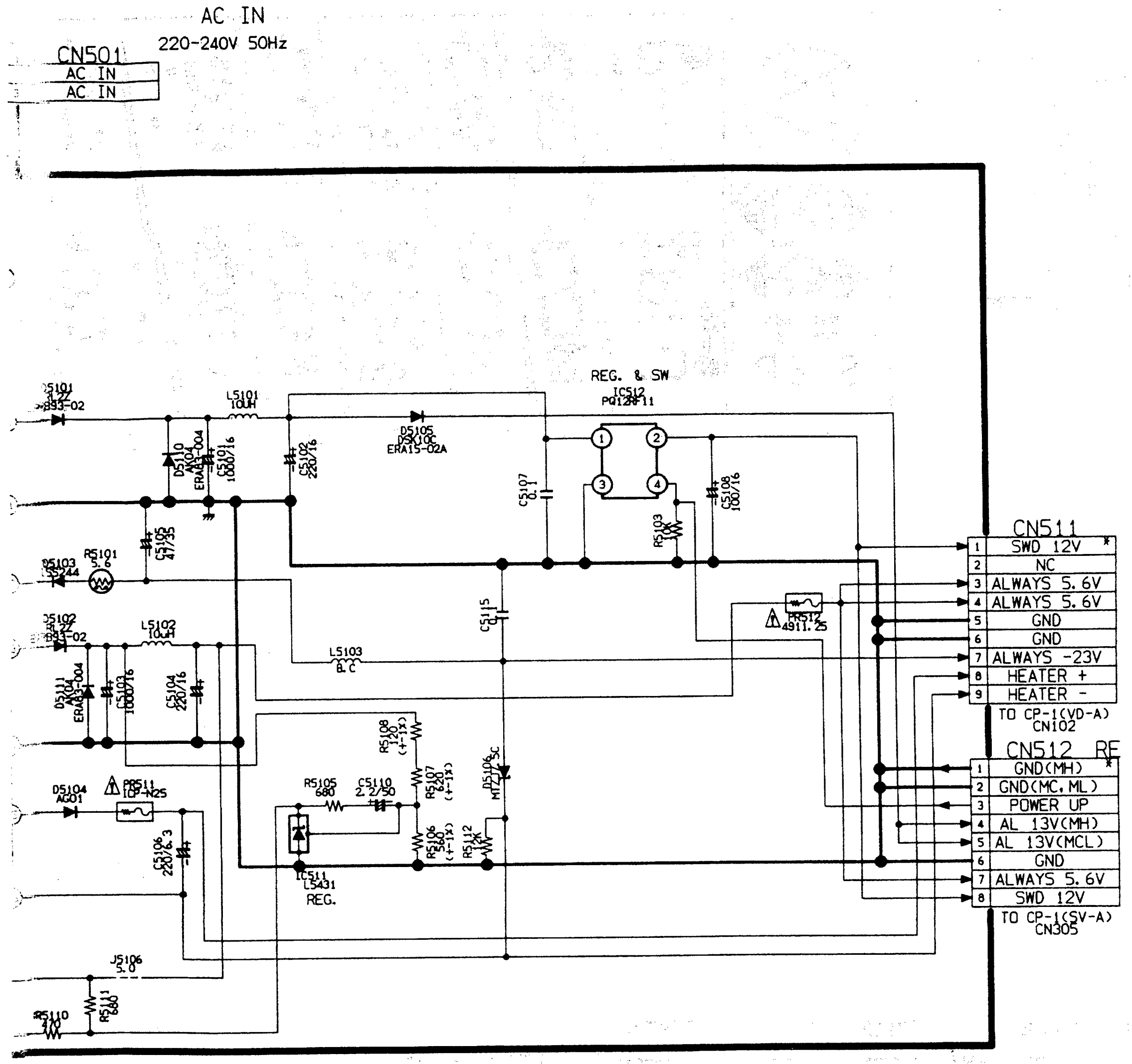
PW-1 BOARD POWER SUPPLY


AC IN
220-240V 50Hz
CN501
AC IN
AC IN
BROWN
BLUE
GREEN
F5001 T2.5A H 250V
PW-1
P1-80085/FE40-EX
L5002
C5002
C5001
R5002
J5001
J5002
VA501
C5004
C5005
D5001 D8C10G
C5010 47/400
T5001 1AV4L51B0931N
※)Discharge C5010 before changing Primary Parts
SW
Q5001
2SK1460
CONTROL & DRIVE
IC501
TDA4605-3
GND
OUT
LowV
Vcc
ON-T. SOFT
F.B
ZERO
D5003
R5019
R5015
C5014
R5016
C5016
R5020
C5015
D5011 PC120FB
R5021
C5018
R5110
R5111
J5106
D5101 ERB93-02
L5101
D5105 ERA15-02A
REG. & SW
IC512 PQ12RF11
C5107
C5108
R5103
D5103
R5101
D5102 ERB93-02
L5102
L5103
D5104
PR511 ICP-N25
R5105
C5110
R5107
R5108
R5109
D5106
R5112
IC511 L5431 REG.
CN511
SWD 12V
NC
ALWAYS 5.6V
ALWAYS 5.6V
GND
GND
ALWAYS -23V
HEATER +
HEATER -
TO CP-1(VD-A) CN102
PR512 4911.25
CN512
GND(MH)
GND(MC.ML)
POWER UP
AL 13V(MH)
AL 13V(MCL)
GND
ALWAYS 5.6V
SWD 12V
TO CP-1(SV-A) CN305

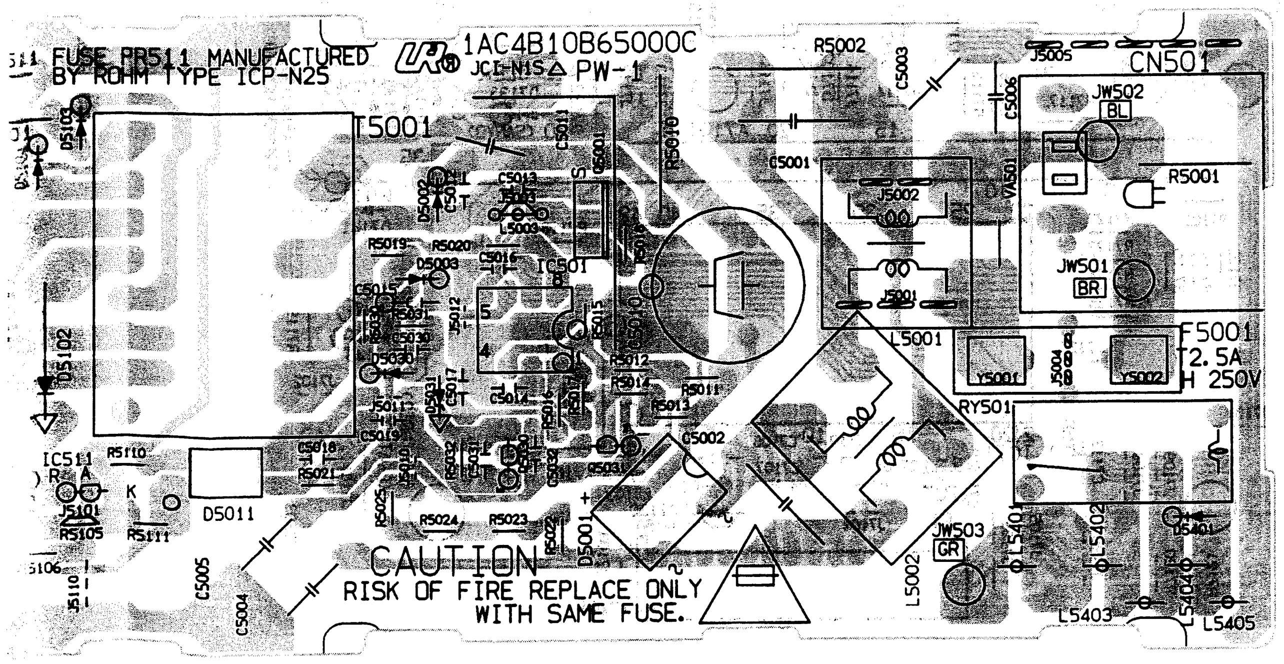
PW-1 P.W.B.


1AC4B10B65000C
JCI-N1S PW-1
FUSE PR511 MANUFACTURED BY ROHM TYPE ICP-N25
FUSE PR512 MANUFACTURED BY LITTELFUSE TYPE 4911.25
CAUTION
RISK OF FIRE REPLACE ONLY WITH SAME FUSE.
CN512
CN511
CN501
JW511
JW512
JW501
JW502
JW503
T5001
IC501
IC511
IC512
Q5104
D5011
F5001 2.5A H 250V
RY501
L5001
L5002
L5101
L5102
L5103
L5401
L5402
L5403
L5405
C5101
C5103
C5104
C5105
R5001
R5002
R5114
R5115
BL
BR
GR

OARD POWER SUPPLY


AC IN
220-240V 50Hz
CN501
AC IN
AC IN
REG. & SW
IC512
PQ12RF11
L5101
D5105
ERA15-02A
C5107
R5103
C5108
C5115
L5102
L5103
PR512
R5108
R5105
C5110
R5107
D5106
R5112
R5106
IC511
L5431
REG.
D5104
PR511
ICP-N25
C5106
J5106
R5110
R5111
CN511
1 SWD 12V
2 NC
3 ALWAYS 5.6V
4 ALWAYS 5.6V
5 GND
6 GND
7 ALWAYS -23V
8 HEATER +
9 HEATER -
TO CP-1(VD-A)
CN102
CN512 RF
1 GND(MH)
2 GND(MC.ML)
3 POWER UP
4 AL 13V(MH)
5 AL 13V(MCL)
6 GND
7 ALWAYS 5.6V
8 SWD 12V
TO CP-1(SV-A)
CN305

PW-1 P.W.B.


FUSE PR511 MANUFACTURED
BY ROHM TYPE ICP-N25
1AC4B10B65000C
PW-1
T5001
R5002
C5003
J5005
CN501
JW502
BL
R5001
JW501
BR
IC501
C5001
J5002
J5001
L5001
F5001
T2.5A
H 250V
RY5001
Y5001
Y5002
C5002
D5011
IC511
R5110
R5105
R5111
C5005
C5004
R5024
R5023
D5001
L5002
JW503
GR
L5401
L5402
L5403
L5404
L5405
CAUTION
RISK OF FIRE REPLACE ONLY
WITH SAME FUSE.

8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24